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THE SIXTH ANNUAL REPORT

OF THE

COMMISSIONER OF HEALTH

OF THE

COMMONWEALTH OF PENNSYLVANIA

1911

PART II

HARRISBURG, PA.:
WM. STANLEY RAY, STATE PRINTER
1913

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DIVISION FOR THE CONTROL OF TUBERCULOSIS.

FRED. C. JOHNSON, M. D., Medical Director of State South Mountain Sanatorium for Tuberculosis at Mont Alto.

THOMAS H. A. STILES, M. D., Medical Inspector of Dispensaries.

SUB DIVISION OF TUBERCULOSIS SANITORIA.

PENNSYLVANIA STATE SOUTH MOUNTAIN SANATORIUM FOR TUBERCULOSIS AT MONT ALTO.

FRED. C. JOHNSON, M. D., MEDICAL DIRECTOR.

REPORT.

During the year additional quarters have been provided for twenty-seven (27) patients, while buildings nearing completion will accommodate sixty-four (64) advanced Hospital patients and one hundred and twenty-two (122) children, the latter including Observation Buildings for twenty-two (22) cases.

During the year we have been obliged to carry an overflow census, so that our capacity has varied between seven hundred and fifty-three (753) and seven hundred and ninety-two (792) beds, the average capacity for the year being seven hundred and seventy-three and forty-two hundredths (773.42) while the daily average number of patients treated has been seven hundred and seventy and ninety-two hundredths (770.92). That the number of patients treated closely approximates the bed capacity of the Sanatorium is due to the fact that we require one week's notice of discharge so that vacancies have been comparatively few.

We have been able to exhaust our waiting list of unnaturalized applicants on two occasions during the year, although the demand for the admission of citizens of the Commonwealth has been such that the early admission of aliens can seldom be assured or prearranged, a condition of affairs that doubtless incurs hardship to such indigent patients, as the majority of the County Institutions to which most of these cases must be referred, do not appear to be properly equipped for their segregation and care.

On January 1, 1911, there were seven hundred and thirty-nine (739) patients under treatment, of whom four hundred and thirty-eight (438) were males and three hundred and one (301) were females. On December 31, 1911, there were remaining in the Sanatorium, seven hundred and forty-eight (748) patients, of whom four hundred and forty-nine (449) were males and two hundred and ninety-nine (299) were females. Of these, five hundred and forty (540) were under treatment in the Incipient Camp, and two hundred and eight (208) were cared for at the Hospital.

Of two thousand one hundred and twenty-two (2,122) cases discharged, seven hundred and seventy-four (774) or 36.47 per cent. were from Philadelphia County, three hundred and thirty-one (331) or 15.59 per cent. were from Allegheny County, so that over one-half of the cases discharged were from the principal centers of population in the State.

Of those discharged, one thousand seven hundred and eighteen (1,718) cases or 80.96 per cent. were native born, while the nativity of the foreign-born are recorded as follows:

Ireland,	92 or 4.33 per cent.
Germany,	59 or 2.78 per cent.
Russia,	49 or 2.31 per cent.
Austria,	43 or 2.03 per cent.
England,	37 or 1.74 per cent.
Italy,	22 or 1.04 per cent.
Scotland,	13 or 0.61 per cent.
Poland,	12 or 0.56 per cent.
Wales,	11 or 0.52 per cent.

The above statistics could not be obtained in nineteen (19) cases.

Records of the nativity of parents of discharged cases show that of the two thousand one hundred and twenty-two (2,122) cases, ten hundred and forty-six (1,046) or 49.29 per cent. the father was born in this country, and that the mother was native born in ten hundred and ninety-one (1,091) or 51.41 per cent. of cases.

Parental nativity records of foreign-born were as follows:

Ireland,		
	Father,	342 or 16.11 per cent.
	Mother,	325 or 15.31 per cent.
Germany,		
	Father,	226 or 10.65 per cent.
	Mother,	186 or 8.76 per cent.
England,		
	Father,	100 or 4.70 per cent.
	Mother,	95 or 4.48 per cent.
Russia,		
	Father,	61 or 2.87 per cent.
	Mother,	56 or 2.64 per cent.
Austria,		
	Father,	50 or 2.35 per cent.
	Mother,	43 or 2.03 per cent.
Italy,		
	Father,	46 or 2.17 per cent.
	Mother,	43 or 2.03 per cent.
Scotland,		
	Father,	32 or 1.50 per cent.
	Mother,	40 or 1.88 per cent.
Wales,		
	Father,	28 or 1.32 per cent.
	Mother,	26 or 1.22 per cent.
Poland,		
	Father,	14 or 0.66 per cent.
	Mother,	14 or 0.66 per cent.

Of the two hundred and fifty-six (256) Incipient cases discharged, thirty (30) or 11.72 per cent. were Apparently Cured, ninety-five (95) or 37.11 per cent. were Arrested, fourteen (14) or 44.53 per cent. were Improved and seventeen (17) or 6.64 per cent. were Progressive.

Of the seven hundred and fifty-two (752) moderately Advanced cases discharged, thirty-six (36) or 4.79 per cent. were Apparently

Cured, two hundred and thirty-five (235) or 31.25 per cent. were Arrested, three hundred and five (305) or 40.56 per cent. were Improved, one hundred and fifty-nine (159) or 21.14 per cent. were Progressive and seventeen (17) or 2.26 per cent. died.

Of the one thousand one hundred and fourteen (1,114) Far Advanced cases, three (3) or .27 per cent. were discharged as Apparently Cured, one hundred and fifty-six (156) or 14 per cent. were Arrested, three hundred and twenty-seven (327) or 29.35 per cent. were Improved, four hundred and twenty-five (425) or 38.15 per cent. were Progressive and two hundred and three (203) or 18. 22 per cent. died.

Of eight hundred and twenty-six (826) in the various stages of the disease who were discharged within three (3) months after admission, thirty-seven (37) or 4.47 per cent. were Arrested. three hundred and twenty (320) or 38.74 per cent. Improved, three hundred and thirty (330) or 39.95 per cent. were Progressive, and one hundred and thirty-nine (139) or 16.83 per cent. died.

Of eight hundred and fifty-three (853) cases discharged after a period of treatment varying from three (3) to six (6) months, thirty-nine (39) or 4.57 per cent. were Apparently Cured, two hundred and ninety-four (294) or 34.47 per cent. were Arrested, three hundred and three (303) or 35.52 per cent. were Improved, one hundred and eighty-three (183) or 21.45 per cent. were Progressive. and thirty-four (34) or 3.98 per cent. died.

Of two hundred and thirty-seven (237) cases discharged after a period of treatment varying from six (6) to nine (9) months, eighteen (18) or 7.59 per cent. were Apparently Cured, eighty-eight (88) or 37.13 per cent. were Arrested, sixty-six (66) or 27.85 per cent. were Improved, forty-three (43) or 18.14 per cent. were Progressive, and twenty-two (22) or 9.28 per cent. died.

Of ninety-five (95) cases discharged after a period of treatment varying from nine (9) months to one year, seven (7) or 7.37 per cent. were Apparently Cured, twenty-seven (27) or 28.42 per cent. were Arrested, twenty-seven (27) or 28.42 per cent. were Improved, twenty-seven (27) or 28.42 per cent. were Progressive, and seven (7) or 7.37 per cent. died.

Of one hundred and eleven (111) cases remaining over one year, five (5) or 4.50 per cent. were discharged as Apparently Cured, forty (40) or 36.04 per cent. were Arrested, thirty (30) or 27.03 per cent. were Improved. eighteen (18) or 16.22 per cent. were Progressive, and eighteen (18) or 16.22 per cent. died.

Of the two thousand one hundred and twenty-two (2,122) discharged cases, one thousand one hundred and forty-one (1,141) or 53.77 per cent. were single and nine hundred and eighty-one (981) or 46.22 per cent. were or had been married.

The age incidence of the patients discharged was as follows:

69 or 3.25 per cent. occurred between the 11th and 15th yrs. inc.
334 or 15.74 per cent. occurred between the 16th and 20th yrs. inc.
836 or 39.39 per cent. occurred between the 21st and 30th yrs. inc.
541 or 25.49 per cent. occurred between the 31st and 40th yrs. inc.
258 or 12.16 per cent. occurred between the 41st and 50th yrs. inc.
73 or 3.44 per cent. occurred between the 51st and 60th yrs. inc.
10 or .47 per cent. occurred between the 61st and 70th yrs. inc.
1 or .047 per cent. occurred between the 71st and 80th yrs. inc.

Our Census Record for the Year is as Follows:

Month.	Capacity.	Daily Average Patients Treated
January,	753	749
February,	753	753.75
March,	755	772.70
April,	755	756.50
May,	755	751
June,	755	782.06
July,	755	769.25
August,	755	779.12
September,	755	774.76
October,	755	772.41
November,	788.03	795.96
December,	787.35	783.70

The average period of treatment for all cases discharged from the Sanatorium during the year was one hundred and twenty-eight and forty-nine hundredths (128.49) days, that for the Incipient class being one hundred and twelve and eighty-nine (112.89) the Moderately Advanced one hundred and twenty-five and ten (125.10) and the Far Advanced, one hundred and thirty-four and fourteen hundredth (134.14) days.

Of those who died, the age incidence was as follows:

7 or 3.18 per cent. died between the 11th and 15th yrs. inc.
30 or 13.64 per cent. died between the 16th and 20th yrs. inc.
73 or 33.18 per cent. died between the 21st and 30th yrs. inc.
62 or 28.18 per cent. died between the 31st and 40th yrs. inc.
36 or 16.36 per cent. died between the 41st and 50th yrs. inc.
10 or 4.54 per cent. died between the 51st and 60th yrs. inc.
2 or .91 per cent. died between the 61st and 70th yrs. inc.

Of these one hundred and fifty-six (156) were males and sixty-four (64) females.

Deaths by months occurred as follows:

Month.	Male.	Female.	Total.
January,	13	1	14
February,	5	7	12
March,	20	6	26
April,	29	10	39
May,	18	6	24
June,	11	5	16
July,	9	3	12
August,	11	5	16
September,	10	2	12
October,	11	8	19
November,	9	7	16
December,	10	4	14
Total,	156	64	220

The following complications acting as direct or contributing causes of death were noted, viz:

Acute miliary tuberculosis,	1
Acute cardiac dilatation,	5
Appendicitis,	2
Cystitis,	1
Delirium tremens,	4
Diabetes mellitus,	1
Endocarditis,	3
Enteritis,	32
Haemorrhage (fatal),	10
Hepatic cirrhosis,	1
Laryngitis,	56
Lobar pneumonia,	1
Meningitis,	7
Nephritis,	4
Pleurisy,	10
Pneumothorax,	14
Pulmonary gangrene,	1
Uraemia,	3

The occupations of patients discharged during the year are shown below in the form employed by the United States Census Bureau and includes reports of nineteen (19) cases that were not examined and classified as regards disease. This report also includes one hundred and thirty (130) cases in which no occupation was given by the patient:

PATIENTS DISCHARGED IN 1911, GROUPED BY OCCUPATIONS. CLASSIFIED ALSO BY NATIVITY AND AGE.

Occupation.	Nativity	Age Incidence.							
		Total	11-15	16-20	21-30	31-40	41-50	51-60	61-70
—MALE—									
Professional group	Total,	38	......	......	22	10	4	2	......
	Native,	32	......	......	21	5	4	2	......
	Foreign.	4	......	......	1	3	0	0	......
	Unknown,	2	......	......	0	2	0	0	......
Architects, Artists and Teachers of Art,	Total,	2	......	......	2	......	......	......	......
	Native,	2	......	......	2	......	......	......	......
	Foreign,	0	......	......	0	......	......	......	......
	Unknown,	0	......	......	0	......	......	......	......

Occupation.	Nativity	Age Incidence.							
		Total	11-15	16-20	21-30	31-40	41-50	51-60	61-70
Clergymen,	Total,	......	......	......	......	......	......	......	......
	Native,	......	......	......	......	......	......	......	......
	Foreign,	......	......	......	......	......	......	......	......
	Unknown,	......	......	......	......	......	......	......	......
Engineers and Surveyors,	Total,	7	......	......	4	1	1	1	......
	Native,	6	......	......	4	0	1	1	......
	Foreign,	1	......	......	0	1	0	0	......
	Unknown,	0	......	......	0	0	0	0	......
Journalists,	Total,	1	......	......	1	......	......	......	......
	Native,	1	......	......	1	......	......	......	......
	Foreign,	0	......	......	0	......	......	......	......
	Unknown,	0	......	......	0	......	......	......	......
Lawyers,	Total,	1	......	......	......	1	......	......	......
	Native,	1	......	......	......	1	......	......	......
	Foreign,	0	......	......	......	0	......	......	......
	Unknown,	0	......	......	......	0	......	......	......
Musicians and Teachers of Music,	Total,	2	......	......	1	1	......	......	......
	Native,	2	......	......	1	1	......	......	......
	Foreign,	0	......	......	0	0	......	......	......
	Unknown,	0	......	......	0	0	......	......	......
Physicians and Surgeons,	Total,	1	......	......	......	1	......	......	......
	Native,	0	......	......	......	0	......	......	......
	Foreign,	1	......	......	......	1	......	......	......
	Unknown,	0	......	......	......	0	......	......	......
Teachers (School),	Total,	4	......	......	3	......	1	......	......
	Native,	4	......	......	3	......	1	......	......
	Foreign,	0	......	......	0	......	0	......	......
	Unknown,	0	......	......	0	......	0	......	......
Others of this class not specified,	Total,	20	......	......	11	6	2	1	......
	Native,	16	......	......	10	3	2	1	......
	Foreign,	2	......	......	1	1	0	0	......
	Unknown,	2	......	......	0	2	0	0	......
Clerical and Official Group,	Total,	123	......	22	45	41	11	4	......
	Native,	117	......	22	42	38	11	4	......
	Foreign,	6	......	0	3	3	0	0	......
	Unknown,	0	......	0	0	0	0	0	......
Bookkeepers, Clerks and Copyists,	Total,	96	......	22	37	27	8	2	......
	Native,	91	......	22	34	25	8	2	......
	Foreign,	5	......	0	3	2	0	0	......
	Unknown,	0	......	0	0	0	0	0	......
Bankers, Brokers and Officials of companies,	Total,	0	......	......	......	......	......	......	......
Collectors, Agents and Auctioneers,	Total,	10	......	......	2	6	1	1	......
	Native,	10	......	......	2	6	1	1	......
	Foreign,	0	......	......	0	0	0	0	......
	Unknown,	0	......	......	0	0	0	0	......
Others of this class not specified,	Total,	17	......	......	6	8	2	1	......
	Native,	16	......	......	6	7	2	1	......
	Foreign,	1	......	......	0	1	0	0	......
	Unknown,	0	......	......	0	0	0	0	......
Mercantile and Trading Group,	Native,	44	......	5	12	16	9	2	0
	Foreign,	20	......	0	2	8	4	4	2
	Unknown,	0	......	0	0	0	0	0	0
	Total,	64	......	5	14	24	13	6	2
Apothecaries and Pharmacists,	Total,	8	......	2	2	3	1	......	......
	Native,	8	......	2	2	3	1	......	......
	Foreign,	0	......	0	0	0	0	......	......
	Unknown,	0	......	0	0	0	0	......	......
Commercial Travelers,	Total,	30	......	1	6	10	10	2	1
	Native,	22	......	1	5	9	7	0	0
	Foreign,	8	......	0	1	1	3	2	1
	Unknown,	0	......	0	0	0	0	0	0

Occupation.	Nativity	Age Incidence.							
		Total	11-15	16-20	21-30	31-40	41-50	51-60	61-70
Merchants and Dealers,	Total,	23	......	2	5	10	2	3	1
	Native,	12	......	2	4	3	1	2	0
	Foreign,	11	......	0	1	7	1	1	1
	Unknown,	0	......	0	0	0	0	0	0
Hucksters and Peddlers,	Total,	3	......	......	1	1	......	1	......
	Native,	2	......	......	1	1	......	0	......
	Foreign,	1	......	......	0	0	......	1	......
	Unknown,	0	......	......	0	0	......	0	......
Others of this class not specified,	Total,	0	......	......	......	......	......	......	......
	Native,	0	......	......	......	......	......	......	......
	Foreign,	0	......	......	......	......	......	......	......
	Unknown,	0	......	......	......	......	......	......	......
Public Entertainment Group,	Total,	21	......	......	7	7	6	1	......
	Native,	17	......	......	6	7	3	1	......
	Foreign,	4	......	......	1	0	3	0	......
	Unknown,	0	......	......	0	0	0	0	......
Hotel and Boarding-House Keepers,	Total,	1	......	......	......	1	......	......	......
	Native,	1	......	......	......	1	......	......	......
	Foreign,	0	......	......	......	0	......	......	......
	Unknown,	0	......	......	......	0	......	......	......
Saloon-Keepers, Liquor Dealers and Bartenders,	Total,	17	......	......	5	5	6	1	......
	Native,	13	......	......	4	5	3	1	......
	Foreign,	4	......	......	1	0	3	0	......
	Unknown,	0	......	......	0	0	0	0	......
Others of this class not specified,	Total,	3	......	......	2	1	......	......	......
	Native,	3	......	......	2	1	......	......	......
	Foreign,	0	......	......	0	0	......	......	......
	Unknown,	0	......	......	0	0	......	......	......
Personal Service Group,	Total,	47	......	3	19	15	7	3	......
	Native,	36	......	3	16	12	5	0	......
	Foreign,	11	......	0	3	3	2	3	......
	Unknown.	0	......	0	0	0	0	0	......
Barbers and Hair-Dressers,	Total,	22	......	2	11	6	2	1	......
	Native,	17	......	2	8	5	2	0	......
	Foreign,	5	......	0	3	1	......	1	......
	Unknown,	0	......	0	0	0	0	0	......
Janitors and Sextons, ..	Total,	2	......	......	......	2	......	......	......
	Native,	2	......	......	......	2	......	......	......
	Foreign,	0	......	......	......	0	......	......	......
	Unknown,	0	......	......	......	0	......	......	......
Policemen, Watchmen and Detectives,	Total,	9	......	......	2	1	4	2	......
	Native,	5	......	......	2	1	2	0	......
	Foreign.	4	......	......	0	0	2	2	......
	Unknown,	0	......	......	0	0	0	0	......
Soldiers, Sailors and Marines,	Total,	1	......	......	1	......	......	......	......
	Native,	1	......	......	1	......	......	......	......
	Foreign,	0	......	......	0	......	......	......	......
	Unknown,	0	......	......	0	......	......	......	......
Others of this class not specified,	Total,	13	......	1	5	6	1	......	......
	Native,	11	......	1	5	4	1	......	......
	Foreign,	2	......	0	0	2	0	......	......
	Unknown,	0	......	0	0	0	0	......	......
Laboring and Servant Group.	Total,	167	4	19	54	53	25	11	1
	Native,	131	3	17	46	44	14	6	1
	Foreign.	35	1	1	8	9	11	5	0
	Unknown,	1	0	1	0	0	0	0	0
Laborers (Not Agricultural),	Total,	144	4	18	41	44	25	11	1
	Native,	114	3	16	35	39	14	6	1
	Foreign,	29	1	1	6	5	11	5	0
	Unknown,	1	0	1	0	0	0	0	0

Occupation.	Nativity	Age Incidence.							
		Total	11-15	16-20	21-30	31-40	41-50	51-60	61-70
Servants,	Total,	23	......	1	13	9	......	......	......
	Native,	17	......	1	11	5	......	......	......
	Foreign,	6	......	0	2	4	......	......	......
	Unknown,	0	......	0	0	0	......	......	......
Manufacturing and Mechanical Industry Group,	Total,	501	1	56	194	140	82	23	5
	Native,	400	1	53	170	103	53	17	3
	Foreign,	94	0	2	21	35	28	6	2
	Unknown,	7	0	1	3	2	1	0	0
Bakers and Confectioners,	Total,	8	......	2	1	4	1	......	......
	Native,	7	......	2	1	3	1	......	......
	Foreign,	1	......	0	0	1	0	......	......
	Unknown,	0	......	0	0	0	0	......	......
Blacksmiths,	Total,	11	......	......	3	5	2	1	......
	Native,	9	......	......	3	5	1	0	......
	Foreign,	2	......	......	......	......	1	1	......
	Unknown,	0	......	......	0	0	0	0	......
Boot and Shoemakers,	Total,	1	......	1	......	......	......	......	......
	Native,	1	......	1	......	......	......	......	......
	Foreign,	0	......	0	......	......	......	......	......
	Unknown,	0	......	0	......	......	......	......	......
Brewers, Distillers and Rectifiers,	Total,	2	......	......	......	......	2	......	......
	Native,	0	......	......	......	......	0	......	......
	Foreign,	2	......	......	......	......	2	......	......
	Unknown,	0	......	......	......	......	0	......	......
Butchers,	Total,	8	......	......	3	4	1	......	......
	Native,	6	......	......	3	2	1	......	......
	Foreign,	2	......	......	0	2	0	......	......
	Unknown,	0	......	......	0	0	0	......	......
Cabinet Makers and Upholsterers,	Total,	5	......	......	2	1	......	2	......
	Native,	4	......	......	2	0	......	2	......
	Foreign,	1	......	......	0	1	......	0	......
	Unknown,	0	......	......	0	0	......	0	......
Carpenters and Joiners,	Total,	22	......	......	8	5	7	2	......
	Native,	19	......	......	8	4	5	2	......
	Foreign,	3	......	......	0	1	2	0	......
	Unknown,	0	......	......	0	0	0	0	......
Cigar Makers and Tobacco Workers,	Total,	10	......	......	4	2	4	......	......
	Native,	9	......	......	4	1	4	......	......
	Foreign,	1	......	......	0	1	0	......	......
	Unknown,	0	......	......	0	0	0	......	......
Clock and Watch Repairers, Jewelers,	Total,	7	......	......	2	5	......	......	......
	Native,	7	......	......	2	5	......	......	......
	Foreign,	0	......	......	0	0	......	......	......
	Unknown,	0	......	......	0	0	......	......	......
Compositors, Printers, and Pressmen,	Total,	17	......	7	8	......	1	1	......
	Native,	16	......	7	7	......	1	1	......
	Foreign,	1	......	0	1	......	0	0	......
	Unknown,	0	......	0	0	......	0	0	......
Coopers,	Total,	2	......	......	......	1	1	......	......
	Native,	1	......	......	......	1	0	......	......
	Foreign,	1	......	......	......	0	1	......	......
	Unknown,	0	......	......	......	0	0	......	......
Engineers and Firemen (Not Railway),	Total,	22	......	2	7	4	9	......	......
	Native,	18	......	2	7	3	6	......	......
	Foreign,	4	......	0	0	1	3	......	......
	Unknown,	0	......	0	0	0	0	......	......
Glass Blowers and Glass Workers,	Total,	20	......	1	11	6	2	......	......
	Native,	17	......	1	10	5	1	......	......
	Foreign,	2	......	0	0	1	1	......	......
	Unknown,	1	......	0	1	0	0	......	......
Hat and Cap Makers,	Total,	3	......	......	2	1	......	......	......
	Native,	2	......	......	2	0	......	......	......
	Unknown,	1	......	......	0	1	......	......	......
	Foreign,	0	......	......	0	0	......	......	......

Occupation.	Nativity	Age Incidence.							
		Total	11-15	16-20	21-30	31-40	41-50	51-60	61 70
Iron and Steelworkers,	Total, ...	67	......	7	22	21	15	2	......
	Native, ...	55	......	7	20	15	11	2	......
	Foreign, ...	11	......	0	1	6	4	0	......
	Unknown, ...	1	......	0	1	0	0	0	......
Leather Makers, ...	Total, ...	1	......	1	......	......	......	......	......
	Native, ...	1	......	1	......	......	......	......	......
	Foreign, ...	0	......	0	......	......	......	......	......
	Unknown, ...	0	......	0	......	......	......	......	......
Leather Workers, ...	Total, ...	1	......	1	......	......	......	......	......
	Native, ...	1	......	1	......	......	......	......	......
	Foreign, ...	0	......	0	......	......	......	......	......
	Unknown, ...	0	......	0	......	......	......	......	......
Machinists, ...	Total, ...	73	......	12	36	15	6	1	3
	Native, ...	56	......	11	31	8	4	1	1
	Foreign, ...	15	......	0	5	6	2	0	2
	Unknown, ...	2	......	1	0	1	0	0	0
Marble and Stone Cutters, ...	Total, ...	13	......	......	3	4	3	2	1
	Native, ...	10	......	......	3	2	2	2	1
	Foreign, ...	3	......	......	0	2	1	0	0
	Unknown, ...	0	......	......	0	0	0	0	0
Masons, ...	Total, ...	0	......	......	......	......	......	......	......
	Native, ...	0	......	......	......	......	......	......	......
	Foreign, ...	0	......	......	......	......	......	......	......
	Unknown, ...	0	......	......	......	......	......	......	......
Mill and Factory Operators, (Textile), ...	Total, ...	51	......	5	27	9	6	3	1
	Native, ...	40	......	5	21	8	4	1	1
	Foreign, ...	10	......	0	5	1	2	2	0
	Unknown, ...	1	......	0	1	0	0	0	0
Millers (Flour and Grist), ...	Total, ...	0	......	......	......	......	......	......	......
	Native, ...	0	......	......	......	......	......	......	......
	Foreign, ...	0	......	......	......	......	......	......	......
	Unknown, ...	0	......	......	......	......	......	......	......
Painters and Glaziers, .	Total, ...	30	......	6	8	10	4	2	......
	Native, ...	26	......	5	8	8	3	2	......
	Foreign, ...	4	......	1	0	2	1	0	......
	Unknown, ...	0	......	0	0	0	0	0	......
Plasterers, ...	Total, ...	4	......	1	......	2	......	1	......
	Native, ...	4	......	1	......	2	......	1	......
	Foreign, ...	0	......	0	......	0	......	0	......
	Unknown, ...	0	......	0	......	0	......	0	.....
Plumbers, Gas and Steam Fitters, ...	Total, ...	21	......	......	10	8	3	......	......
	Native, ...	20	......	....	10	7	3	......	......
	Foreign, ...	0	......	......	0	0	0	......	......
	Unknown, ...	1	......	......	0	1	0	......	......
Tailors, ...	Total, ...	25	......	1	7	12	2	3	......
	Native, ...	8	......	0	3	5	0	0	......
	Foreign, ...	16	......	1	4	7	1	3	......
	Unknown, ...	1	......	0	0	0	1	0	......
Tinners and Tinware Makers, ...	Total, ...	7	......	......	4	2	......	1	......
	Native, ...	5	......	......	3	1	......	1	......
	Foreign, ...	2	......	......	1	1	......	0	......
	Unknown, ...	0	......	......	0	0	......	0	......
Others of this class not specified, ...	Total, ...	70	1	9	26	19	13	2	......
	Native, ...	58	1	9	22	18	6	2	......
	Foreign, ...	12	0	0	4	1	7	0	......
	Unknown, ...	0	0	0	0	0	0	0	......
Agricultural and Transportation Group, ...	Total, ...	231	3	20	88	63	45	9	3
	Native, ...	166	3	19	75	38	22	7	2
	Foreign, ...	62	0	1	13	22	23	2	1
	Unknown, ...	3	0	0	0	3	0	0	0
Boatmen and Canalmen,	Total, ...	2	......	......	......	......	1	......	......
	Native, ...	2	......	......	......	......	1	......	......
	Foreign, ...	0	......	......	......	......	0	......	......
	Unknown, ...	0	......	......	......	......	0	......	......

Occupation.	Nativity	Age Incidence.							
		Total	11–15	16–20	21–30	31–40	41–50	51–60	61–70
Draymen, Hackmen and Teamsters, ...	Total, ...	45	1	5	15	13	9	1	1
	Native, ...	39	1	5	14	10	7	1	1
	Foreign, ...	6	0	0	1	3	2	0	0
	Unknown, ...	0	0	0	0	0	0	0	0
Farmers, Planters, and Farm Laborers, ...	Total, ...	21	1	5	6	2	6	1	......
	Native, ...	17	1	5	5	1	4	1	......
	Foreign, ...	3	0	0	1	0	2	0	......
	Unknown, ...	1	0	0	0	1	0	0	......
Gardeners, Florists and Nurserymen, ...	Total, ...	11	......	1	2	4	1	3	......
	Native, ...	9	......	1	1	4	1	2	......
	Foreign, ...	2	......	0	1	0	0	1	......
	Unknown, ...	0	......	0	0	0	0	0	......
Livery Stable Keepers and Hostlers, ...	Total, ...	4	......	......	3	......	1	......	......
	Native, ...	3	......	......	2	......	1	......	......
	Foreign, ...	1	......	......	1	......	0	......	......
	Unknown, ...	0	......	......	0	......	0	......	......
Lumbermen and Raftsmen, ...	Foreign, ...	0	......	......	0	......	0	......	......
	Total, ...	3	......	......	2	......	1	......	......
	Native, ...	3	......	......	2	......	1	......	......
	Unknown, ...	0	......	......	0	......	0	......	.... .
Miners and Quarrymen,	Total, ...	62	1	4	6	27	20	2	2
	Native, ...	19	1	3	2	9	2	1	1
	Foreign, ...	41	0	1	4	16	18	1	1
	Unknown, ...	2	0	0	0	2	0	0	0
Sailors, Pilots and Fishermen, ...	Total, ...	2	......	1	......	1	......	......	......
	Native, ...	2	......	1	......	1	......	......	......
	Foreign, ...	0	......	0	......	0	......	......	......
	Unknown, ...	0	......	0	......	0	......	......	......
Stock Raisers, Herders, and Drivers, ...	Total, ...	2	......	......	1	......	1	......	......
	Native, ...	2	......	......	1	......	1	......	......
	Foreign, ...	0	......	......	0	......	0	......	......
	Unknown, ...	0	......	......	0	......	0	......	......
Steam Railroad Employees, ...	Total, ...	35	......	1	20	9	3	2	......
	Native, ...	32	......	1	20	7	2	2	......
	Foreign, ...	3	......	0	0	2	1	0	......
	Unknown, ...	0	......	0	0	0	0	0	......
Others of this class not specified, ...	Total, ...	44	......	3	32	7	2	......	......
	Native, ...	38	......	3	27	6	2	......	......
	Foreign, ...	6	......	0	5	1	0	......	......
	Unknown, ...	0	......	0	0	0	0	......	......
All other male occupations, ...	Total, ...	77	5	21	22	18	10	1	......
	Native, ...	65	5	20	22	15	3	0	......
	Foreign, ...	10	0	1	0	1	7	1	......
	Unknown, ...	2	0	0	0	2	0	0	......
No occupation, ...	Total, ...	38	14	20	3	......	1	......	......
	Native, ...	38	14	20	3	......	1	......	......
	Foreign, ...	0	0	0	0	......	0	......	......
	Unknown, ...	0	0	0	0	......	0	......	......
—FEMALE—									
Artificial Flower and Paper Box Makers, ..	Total, ...	1	......	2	2	......	......	......	......
	Native, ...	4	......	2	2	......	......	......	......
	Foreign, ...	0	......	0	0	......	......	......	.... .
	Unknown, ...	0	......	0	0	......	......	......	......
Bookkeepers, Clerks, Coypists, ...	Total, ...	53	2	13	31	5	2	......	......
	Native, ...	51	2	13	29	5	2	......	......
	Foreign, ...	2	0	0	2	0	0	......	......
	Unknown, ...	0	0	0	0	0	0	......	......
Cigar Makers, Tobacco Workers, ...	Total, ...	1	......	......	1	......	......	......	......
	Native, ...	1	......	......	1	......	......	......	......
	Foreign, ...	0	......	......	0	......	......	......	......
	Unknown, ...	0	......	......	0	......	......	......	......

Occupation.	Nativity	Age Incidence.							
		Total	11–15	16–20	21–30	31–40	41–50	51–60	61–70
Dressmakers and Seamstresses, ...	Total, ...	37	1	3	16	13	3	1	......
	Native, ...	32	0	2	15	12	2	1	......
	Foreign, ...	4	0	1	1	1	1	0	......
	Unknown, ...	1	1	0	0	0	0	0	......
Hotel and Boarding-House Keepers, ...	Total, ...	0	......	......	......	......	......	......	......
	Native, ...	0	......	......	......	......	......	......	......
	Foreign, ...	0	......	......	......	......	......	......	......
	Unknown, ...	0	......	......	......	......	......	......	......
Laundresses, ...	Total, ...	15	......	2	7	4	2	......	......
	Native, ...	11	......	1	6	2	2	......	......
	Foreign, ...	3	......	1	1	1	1	......	......
	Unknown, ...	1	......	0	0	1	0	......	......
Milliners, ...	Total, ...	10	1	......	7	1	1	......	......
	Native, ...	10	1	......	7	1	1	......	......
	Foreign, ...	0	0	......	0	0	0	......	......
	Unknown, ...	0	0	......	0	0	0	......	......
Mill and Factory Operatives, ...	Total, ...	71	3	32	24	11	1	......	......
	Native, ...	61	3	31	20	7	0	......	......
	Foreign, ...	10	0	1	4	4	1	......	......
	Unknown, ...	0	0	0	0	0	0	......	..
Musicians and Teachers of Music, ...	Total, ...	4	......	1	1	2	......	......	......
	Native, ...	4	......	1	1	2	......	......	......
	Foreign, ...	0	......	0	0	0	......	......	......
	Unknown, ...	0	......	0	0	0	......	......	......
Nurses and Midwives, .	Total, ...	13	......	1	8	2	2	......	......
	Native, ...	11	......	1	7	2	1	......	......
	Foreign, ...	2	......	0	1	0	1	......	......
	Unknown, ...	0	......	0	0	0	0	......	......
Servants, ...	Total, ...	0	......	......	......	......	......	......	......
	Native, ...	0	......	......	......	......	......	......	......
	Foreign, ...	0	......	......	......	......	......	......	......
	Unknown, ...	0	......	......	......	......	......	......	......
Stenographers and Typewriters, ...	Total, ...	11	......	2	6	3	......	......	......
	Native, ...	11	......	2	6	3	......	......	......
	Foreign, ...	0	......	0	0	0	......	......	......
	Unknown, ...	0	......	0	0	0	......	......	......
Teachers in Schools, . ..	Total, ...	11	......	1	7	3	......	......	......
	Native, ...	11	......	1	7	3	......	......	......
	Foreign, ...	0	......	0	0	0	......	......	......
	Unknown, ...	0	......	0	0	0	......	......	......
Telegraph and Telephone Operators, ...	Total, ...	12	......	4	7	1	......	......	......
	Native, ...	12	......	4	7	1	......	......	......
	Foreign, ...	0	......	0	0	0	......	......	......
	Unknown, ...	0	......	0	0	0	......	......	......
All other occupations, .	Total, ...	500	5	70	238	128	46	13	......
	Native, ...	384	5	66	182	94	28	9	......
	Foreign, ...	113	0	4	55	31	16	4	......
	Unknown, ...	3	0	0	1	0	2	0	......
No Occupation, ...	Total, ...	92	30	38	20	3	1	......	......
	Native, ...	85	26	38	18	2	1	......	......
	Foreign, ...	7	4	0	2	1	0	......	......
	Unknown, ...	0	0	0	0	0	0	......	......
Total:—Female, ...	Total, ...	834	42	169	375	177	58	14	......
	Native, ...	688	37	162	308	134	37	10	......
	Foreign, ...	141	4	7	66	41	19	4	......
	Unknown, ...	5	1	0	1	1	2	0	......
No Occupation, ...	Total, ...	130	44	58	23	3	2	......	......
	Native, ...	123	40	58	21	2	2	......	......
	Foreign, ...	7	4	0	2	1	0	......	......
	Unknown, ...	0	0	0	0	0	0	......	......
All Occupations, ...	Total, ...	2011	25	277	820	544	260	74	11
	Native, ...	1611	23	263	700	410	160	49	6
	Foreign, ...	380	1	12	116	124	97	25	5
	Unknown, ...	20	1	2	4	10	3	0	0

During the year a total of eight thousand seven hundred and seventy-four (8,774) specimens of sputum and four thousand seven hundred and twenty-one (4,721) specimens of urine were examined at the Laboratory and reports forwarded to the various physicians. These examinations cover those made on admission and discharge together with interval examinations of such specimens as required by routine and in the face of emergencies. Routine examinations of the milk supply have been conducted for the presence of pathogenic bacteria, adulterants, and preservatives. Blood counts, examinations of faeces, spinal fluid, pleural effusions, and other fluids and discharges have been made from time to time as required in special cases.

On Christmas day, Christmas trees were provided for the patients in the Main Dining Room Building and the Hospital, from which gifts were distributed to all patients under treatment. The Dining Rooms were appropriately decorated and orchestra music provided for those in the Main Dining Room Building during the dinner hour.

As in the past, religious services have been conducted by Clergymen of the Episcopalian, Roman Catholic, and Lutheran faith.

Despite the frequent changes on the Staff of "Spunk," the publication has now become a fifty-two page magazine with a circulation of over thirteen hundred (1,300) copies each month. Among its contributors and interested friends are His Excellency, Governor John K. Tener, Dr. Henry Van Dyke, Leigh Mitchell Hodges, Elbert Hubbard, Jane Addams and others occupying prominent positions in the affairs of the State and Nation.

Our Library is growing rapidly and now consists of approximately ten hundred and fifty (1,050) bound volumes.

A number of theatrical entertainments have been given by the patients during the year, the performances taking place in the Dining Room, the only available quarters for such entertainments. Owing, however, to the inconvenience and great amount of labor required to make the necessary arrangements, such amusements have unfortunately been curtailed.

There is need of a building more centrally located for Library use and we believe an amusement hall providing space for library and reading rooms would add much to the enjoyment and contentment of patients under treatment in this Sanatorium.

Convalescent patients have been allowed walking exercise and have in addition performed a great deal of light work, always being under medical supervision and the actual work under the supervision of a competent foreman, a former patient.

In addition to performing the light work required about the Sanatorium grounds, convalescent patients have made here all the night sputum cup fillers used by Dispensary patients throughout the State, and have also numbered the paper napkins and pocket sputum cups used by Sanatorium patients.

During the year the following work was performed:

Kitchen extension at Hospital underdrained.

Grading around Hospital and Staff Buildings partially completed.

Sewer connections made to Staff Building at Hospital.

Extension of fire lines at Hospital.

Extension of sewers from acetylene plant at Hospital and Camp.

Grading at Chapel, Children's Building and Staff Building partially completed.

Sewer and water connections made to Chapel.

Connections to fire line at Incipient Camp Staff Building.

Macadamizing ten thousand seven hundred (10,700) feet of the road by way of Brandon's Hollow.

Nineteen hundred and eighty (1,980) feet of cobble gutter along Second and Fourth Streets.

Concrete culvert provided at the lower entrance of Sanatorium grounds.

During the year approximately one and one half ($1\frac{1}{2}$) acres of ground have been used as a truck garden from which vegetables have been obtained for the needs of the Staff and employees.

Eleven (11) tons of hay and seventeen hundred and fifty (1,750) bushels of potatoes were raised during the year.

Among the Staff Changes occurring during the year, I deeply regret being obliged to make note of the death of Miss Addah Strouse, Head Nurse, at Asheville, N. C. on August 10, 1911. Miss Strouse occupied this position for a period of about nineteen months, and her conscientious, painstaking work added incalculably to the progress of the Sanatorium.

Mrs. Maud Emery McCarthy resigned following her marriage to Dr. F. P. McCarthy and was succeeded by Miss S. Zimmerman, of the Nursing Staff, as Acting Matron at the Hospital.

Dr. S. Swayne Putts, Deputy Medical Director, resigned October 1, 1911, to engage in practice at Erie, Pa.

Dr. Putts was succeeded by Dr. John Berry of the Resident Staff

Dr. R. A. Koronski, Bacteriologist, resigned September 1, 1911.

Dr. A. Trumper succeeded Dr. Koronski as Bacteriologist.

Dr. Fred C. Hyatt resigned July 15th to engage in practice at Greensburg, N. C.

Dr. F. P. McCarthy resigned December 1, 1911 to engage in practice at Erie, Pa.

Dr. Carl E. Koenig resigned July 1st, 1911, to engage in practice at Seattle, Washington.

Dr. H .E. Orndorff resigned after a brief service on the Resident Staff.

Dr. Charles S. Rebuck of Harrisburg was appointed to the position of Visiting Laryngologist.

Dr. George B. Kunkel of Harrisburg was appointed to the position of Consulting Surgeon.

Doctors Chester G. Crist, Henry A. Gorman, Lloyd A. Heikes, and Joseph A. Stockler, were appointed to positions on the Resident Staff.

Contributions for the year have been as follows:

Needlework Guild of America, Philadelphia, clothing.
Ella Kirk Davis, Philadelphia, fruit.
Mrs. J. Taylor, (Philomusian Club), Philadelphia, clothing.
Woman's Club, Media, clothing.
Civic Club, Harrisburg, clothing.
M. Seibert, Chambersburg, Woman's National Daily 10 years.
Carrie E. Eppley, Sanatorium, Communion set for chapel.
Mrs. Chester Spare, Phoenixville, clothing.
Mrs. S. G. Dixon, Bryn Mawr, clothing and books.
Mrs. A. E. Beman, Ridgway, clothing.
Mrs. G. H. Brinton, Elwyn, clothing.
E. A. Owen, New Bloomfield, clothing.
Miss Sara W. Schell, Altoona, reading matter.
P. S. Williams, Bryn Mawr, reading matter.
Mr. Heitzman, Harrisburg, clothing.
Mrs. S. G. Dixon, Bryn Mawr, clothing and books.
The Chi Club, Greencastle, clothing.
Woman's Club, Mechanicsburg, clothing and magazines.
Langhorne Sorosis Club, Langhorne, clothing.
Mrs. J. D. Winsor, Haverford, wristlets.
Isabel S. Hough, Williamsport, magazines.
Mrs. Charles Robinson, Chester, clothing.
Dr. S. G. Dixon, Bryn Mawr, clothing.
Hospital Magazine Guild, Harrisburg, reading matter.
Rev. George Parker, Mont Alto, potted plants (29).
Jane Buchanan (Woman's Club), Beaver, magazines.
Mrs. John Lloyd, Jr., Hollidaysburg, clothing.
Miss C. H. Dixon, Bryn Mawr, clothing.
Mrs. S. G. Dixon, Bryn Mawr, 1 phonograph and 29 records.
Miss C. H. Dixon, Bryn Mawr, clothing and games.
J. E. Diggles, Williamsport, clothing.
William H. Ennis, Harrisburg, books.
(No name), clothing, 1 book.
The Calvary Settlement, Philadelphia, clothing.
Mrs. E. B. Diehl, Lemaster, reading matter.
Mrs. Blakiston, Philadelphia, scrap book.
Mrs. S. G. Dixon, Bryn Mawr, clothing.
Mrs. Horstman, Villa Nova, clothing.
Mrs. S. C. Bailey, Harrisburg, clothing.
Mrs. D. F. Good, Lock Haven, slumber shoes.
Mr. Rembrant Peal, Lock Haven, slumber shoes.
Mrs. Frederick Moore, Lock Haven, slumber shoes.
Needlework Guild of America, Hatboro, clothing.
Needlework Guild of America, Lansdowne, clothing.
Needlework Guild of America, Shippensburg, clothing and magazines.
Carlisle Indian School, Carlisle, clothing for student patients.
Mrs. B. Jackson, Gloucester, N. J., magazines.
Lydia W. Drinker, Bloomsburg, clothing.
A. Margaret West, Waynesboro, clothing.
Thursh & Stough, Shippensburg, magazines.
Mrs. I. D. Van Horn, Norristown, Xmas box, clothing, etc.
Woman's Club, Phoenixville, clothing.
Mrs. E. S. Dixon, Ardmore, Christmas stockings.
Charles H. LaWall, Philadelphia, Christmas gifts.
David Knepper, Mont Alto, calendars.
Board of Game Commissioners, Pennsylvania, 2 doe deer and 1 spike buck deer.

CLASSIFICATION OF INCIPIENT PATIENTS DISCHARGED DURING 1911, PENNSYLVANIA STATE SOUTH MOUNTAIN SANATORIUM.

	White.	Black.	Male.	Female.	Married.	Single.	Total.	Per cent.
Patients discharged during 1911, ...	248	8	138	118	90	166	256	
As apparently cured, ...	28	2	15	15	8	22	30	11.72
As "arrested,"	91	4	49	46	30	65	95	37.11
As improved, ...	111	0	65	49	44	70	114	44.53
As progressive, ...	15	2	9	8	8	9	17	6.64
By death, ...	0	0	0	0	0	0	0	......
Gained in weight, ...	220	5	124	101	77	148	225	87.89
Lost in weight, ...	19	3	7	15	8	14	22	8.59
Unchanged in weight, ...	9	0	7	2	5	4	9	3.51

CLASSIFICATION OF INCIPIENT PATIENTS DISCHARGED FROM PENNSYLVANIA STATE SOUTH MOUNTAIN SANATORIUM IN 1911, REMAINING UNDER TREATMENT FOR LESS THAN THREE MONTHS.

	White.	Black.	Male.	Female.	Married.	Single.	Total.	Per cent.
Patients discharged during 1911, ...	95	1	59	37	45	51	96	....
As apparently cured, ...	0	0	0	0	0	0	0	....
As "arrested,"	11	0	6	5	7	4	11	11.46
As improved, ...	74	0	47	27	31	43	74	77.08
As progressive, ...	10	1	6	5	7	4	11	11.46
By death, ...	0	0	0	0	0	0	0	......
Gained in weight, ...	78	0	49	29	34	44	78	81.25
Lost in weight, ...	7	1	2	6	5	3	8	8.33
Unchanged in weight, ...	10	0	8	2	6	4	10	10.42

CLASSIFICATION OF INCIPIENT PATIENTS DISCHARGED FROM PENNSYLVANIA STATE SOUTH MOUNTAIN SANATORIUM DURING 1911, REMAINING UNDER TREATMENT FROM THREE TO SIX MONTHS.

	White.	Black.	Male.	Female.	Married.	Single.	Total.	Per cent.
Patients discharged during 1911, ...	113	4	64	53	37	80	117	
As apparently cured.	17	1	10	8	7	11	18	15.38
As "arrested,"	61	3	38	26	19	45	64	54.70
As improved.	33	0	15	18	11	22	33	28.20
As progressive, ...	2	0	1	1	0	2	2	1.71
By death.	0	0	0	0	0	0	0	......
Gained in weight, ...	107	4	63	48	36	75	111	94.87
Lost in weight, ...	4	0	0	4	1	3	4	3.42
Unchanged in weight, ...	2	0	1	1	0	2	2	1.71

CLASSIFICATION OF INCIPIENT PATIENTS DISCHARGED FROM PENNSYLVANIA STATE SOUTH MOUNTAIN SANATORIUM DURING 1911, REMAINING UNDER TREATMENT FROM SIX TO NINE MONTHS.

	White.	Black.	Male.	Female.	Married.	Single.	Total.	Per cent.
Patients discharged during 1911, ...	23	2	6	19	7	18	25	
As apparently cured, ...	7	1	3	5	1	7	8	32
As "arrested,"	12	0	2	10	3	9	12	48
As improved, ...	4	0	1	3	2	2	4	16
As progressive.	0	1	0	1	1	0	1	4
By death, ...	0	0	0	0	0	0	0	......
Gained in weight, ...	21	1	5	17	6	16	22	88
Lost in weight, ...	2	1	1	2	1	2	3	12
Unchanged in weight, ...	0	0	0	0	0	0	0	....

CLASSIFICATION OF INCIPIENT PATIENTS DISCHARGED FROM PENNSYLVANIA STATE SOUTH MOUNTAIN SANATORIUM DURING 1911, REMAINING UNDER TREATMENT FROM NINE TO TWELVE MONTHS.

	White.	Black.	Male.	Female.	Married.	Single.	Total.	Per cent.
Patients discharged during 1911, ...	11	1	6	6	0	12	12	
As apparently cured, ...	3	0	2	1	0	3	3	25.
As "arrested,"	3	1	1	3	0	4	4	33.33
As improved, ...	3	0	2	1	0	3	3	25
As progressive, ...	2	0	1	1	0	2	2	16.67
By death, ...	0	0	0	0	0	0	0	......
Gained in weight, ...	8	0	4	4	0	8	8	66.67
Lost in weight, ...	3	1	2	2	0	4	4	33.33
Unchanged in weight, ...	0	0	0	0	0	0	0	....

CLASSIFICATION OF INCIPIENT PATIENTS DISCHARGED FROM PENNSYLVANIA STATE SOUTH MOUNTAIN SANATORIUM DURING 1911, REMAINING UNDER TREATMENT OVER ONE YEAR.

	White.	Black.	Male.	Female.	Married.	Single.	Total.	Per cent.
Patients discharged during 1911, ...	6	0	3	3	1	5	6	
As apparently cured, ...	1	0	0	1	0	1	1	16.67
As "arrested,"	4	0	2	2	1	3	4	66.67
As improved, ...	0	0	0	0	0	0	0	....
As progressive, ...	1	0	1	0	0	1	1	16.67
By death, ...	0	0	0	0	0	0	0	......
Gained in weight, ...	6	0	3	3	1	5	6	100
Lost in weight, ...	0	0	0	0	0	0	0	......
Unchanged in weight, ...	0	0	0	0	0	0	0	....

CIVIL CONDITION OF INCIPIENT PATIENTS DISCHARGED DURING 1911.

	Male.	Female.	Total.	Per cent.
Married,	52	22	74	28.91
Single,	80	86	166	64.84
Widowed,	6	10	16	6.25
Divorced,	0	0	0	......
Grand total,	138	118	256	......

AGE INCIDENCE AND MORTALITY OF INCIPIENT PATIENTS DISCHARGED DURING 1911.

	Age Incidence.				Mortality.			
	Male.	Female.	Total.	Per cent.	Male.	Female.	Total.	Per cent.
1 to 5 years inc.,	0	0	0	......	0	0	0	......
6 to 10 years inc.,	0	0	0	......	0	0	0	......
11 to 15 years inc.,	12	14	26	10.16	0	0	0	......
16 to 20 years inc.,	33	39	72	28.12	0	0	0	......
21 to 30 years inc.,	50	44	94	36.72	0	0	0	......
31 to 40 years inc.,	27	18	45	17.58	0	0	0	......
41 to 50 years inc.,	11	3	14	5.47	0	0	0	......
51 to 60 years inc.,	5	0	5	1.95	0	0	0	......
61 to 70 years inc.,	0	0	0	......	0	0	0	......
Grand total	138	118	256	......	0	0	0	......

NATIVITY OF INCIPIENT PATIENTS DISCHARGED DURING 1911.

	Male.	Female.	Total.	Per cent.
United States,	112	104	216	84.37
England,	2	1	3	1.17
Ireland,	5	3	8	3.12
Austria,	2	0	2	.78
Germany,	2	1	3	1.17
Roumania,	1	0	1	.39
Russia,	3	3	6	2.34
Sweden,	0	0	0	....
Italy,	2	2	4	1.56
Wales,	2	1	3	1.17
Switzerland,	0	0	0	....
France,	0	0	0	....
Hungary,	1	0	1	.39
Not given,	1	0	1	.39
Canada,	1	0	1	.39
Scotland,	1	1	2	.78
Poland,	2	2	4	1.56
Belgium,	1	0	1	.39
Grand total,	138	118	256	....

PARENTAL NATIVITY OF INCIPIENT PATIENTS DISCHARGED DURING 1911.

Father born in	Male.	Female.	Total.	Per cent.
United States,	70	60	130	50.78
England,	7	6	13	5.08
Ireland,	22	15	37	14.45
Austria,	2	0	2	.78
Germany,	11	11	22	8.59
Roumania,	0	0	0	....
Russia,	5	3	8	3.12
Sweden,	1	0	1	.39
Italy,	3	5	8	3.12
Poland,	2	1	3	1.17
Wales,	3	2	5	1.95
Scotland,	0	2	2	.77
France,	0	1	1	.39
Hungary,	0	1	1	.39
Canada,	1	3	4	1.56
Sicily,	0	0	0	....
Not given,	10	8	18	7.03
Belgium,	1	0	1	.39
Grand total,	138	118	256	....

PARENTAL NATIVITY OF INCIPIENT PATIENTS DISCHARGED DURING 1911.

Mother born in	Male.	Female.	Total.	Per cent.
United States,	75	64	139	54.29
England,	5	5	10	3.90
Ireland,	21	13	34	13.28
Austria,	1	0	1	.39
Germany,	10	8	18	7.03
Roumania,	0	0	0	....
Russia,	5	2	7	2.73
Sweden,	1	0	1	.39
Italy,	3	4	7	2.73
Poland,	2	1	3	1.17
Wales,	2	3	5	1.95
Scotland,	0	3	3	1.17
France,	0	0	0	....
Hungary,	0	1	1	.39
Canada,	2	3	5	1.95
Sicily,	0	0	0	....
Not given,	10	11	21	8.20
Belgium,	1	0	1	.39
Grand total,	138	118	256	....

INCIPIENT PATIENTS DISCHARGED DURING 1911—BY DISPENSARIES.

Dispensary.	Male.	Female.	Total.	Dispensary.	Male.	Female.	Total.
1,	7	8	15	9,	3	0	3
2,	6	0	6	10,	......	......	......
3,	0	2	3	11,	......	......	......
4,	......	......	......	12,	3	0	3
5,	......	......	......	13,	11	9	20
6,	......	......	......	14,	2	3	5
7,	......	......	......	15,	2	1	3
8,	......	......	......	16,	......	......	......

INCIPIENT PATIENTS DISCHARGED DURING 1911—BY DISPENSARIES—Continued.

Dispensary.	Male.	Female.	Total.	Dispensary.	Male.	Female.	Total.
17,	......	......	......	66,	2	2	4
18,	......	......	......	67,	0	1	1
19,	......	......	......	68,	6	7	13
20,	10	12	22	69,	0	1	1
21,	41	35	76	70,	0	3	3
22,	......	......	......	71,	0	1	1
23,	0	1	1	72,	......	......	......
24,	......	......	......	73,	......	......	......
25,	......	......	......	74,	......	......	......
26,	......	......	......	75,	1	0	1
27,	......	......	......	76,	......	......	......
28,	0	1	1	77,	1	0	1
29,	......	......	......	78,	......	......	......
30,	......	......	......	79,	......	......	......
31,	......	......	......	80,	......	......	......
32,	1	1	2	81,	2	0	2
33,	1	1	2	82,	0	1	1
34,	......	......	......	83,	1	0	1
35,	......	......	......	84,	......	......	......
36,	......	......	......	85,	1	1	2
37,	2	0	2	86,	......	......	......
38,	......	......	......	87,	1	0	1
39,	2	1	3	88,	0	1	1
40,	4	1	5	89,	0	1	1
41,	......	......	......	90,	0	1	1
42,	0	1	1	91,	......	......	......
43,	......	......	......	92,	......	......	......
44,	......	......	......	93,	......	......	......
45,	......	......	......	94,	1	0	1
46,	......	......	......	95,	......	......	......
47,	0	1	1	96,	1	0	1
48,	......	......	......	97,	......	......	......
49,	0	1	1	98,	......	......	......
50,	......	......	......	99,	......	......	......
51,	......	......	......	100,	1	0	1
52,	......	......	......	101,	1	1	2
53,	......	......	......	102,	......	......	......
54,	......	......	......	103,	......	......	......
55,	......	......	......	104,	1	0	1
56,	......	......	......	105,	2	2	4
57,	1	1	2	106,	......	......	......
58,	......	......	......	107,	7	4	11
59,	......	......	......	108,	......	......	......
60,	1	1	2	109,	7	7	14
61,	1	0	1	110,	0	1	1
62,	1	0	1	111,	......	......	......
63,	......	......	......	112,	......	......	......
64,	1	1	2				
65,	1	0	1	Grand total,	138	118	256

INCIPIENT PATIENTS DISCHARGED DURING 1911—COUNTIES.

	Male.	Female.	Total.
Adams,	1	1	2
Allegheny,	21	20	41
Armstrong,	......	......	......
Beaver,	0	1	1
Bedford,	1	0	1
Berks,	2	0	2
Blair,	2	3	5
Bradford,	......	......	......
Bucks,	0	2	2
Butler,	2	1	3
Cambria,	3	1	4
Cameron,	......	......	......

INCIPIENT PATIENTS DISCHARGED DURING 1911—COUNTIES—Con't.

	Male.	Female.	Total.
Carbon,	0	1	1
Centre,	....	....	....
Chester,	1	0	1
Clarion,	....	....	....
Clearfield,	1	0	1
Clinton,	....	....	....
Columbia,	0	1	1
Crawford,	0	1	1
Cumberland,	1	0	1
Dauphin,	9	9	18
Delaware,	3	0	3
Elk,	0	1	1
Erie,	0	3	3
Fayette,	0	3	3
Forest,	....	....	....
Franklin,	....	....	....
Fulton,	....	....	....
Greene,	1	0	1
Huntingdon,	0	1	1
Indiana,	....	....	....
Jefferson,	1	0	1
Juniata,	....	....	....
Lackawanna,	4	1	5
Lancaster,	3	1	4
Lawrence,	....	....	....
Lebanon,	....	....	....
Lehigh,	....	....	....
Luzerne,	12	16	28
Lycoming,	1	1	2
McKean,	....	....	....
Mercer,	....	....	....
Mifflin,	....	....	....
Monroe,	1	0	1
Montgomery,	....	....	....
Montour,	0	1	1
Northampton,	1	0	1
Northumberland,	0	1	1
Perry,	1	0	1
Philadelphia,	48	38	86
Pike,	....	....	....
Potter,	....	....	....
Schuylkill,	4	3	7
Snyder,	....	....	....
Somerset,	....	....	....
Sullivan,	1	0	1
Susquehanna,	0	1	1
Tioga,	1	0	1
Union,	....	....	....
Venango,	0	1	1
Warren,	....	....	....
Washington,	3	2	5
Wayne,	....	....	....
Westmoreland,	2	2	4
Wyoming,	....	....	....
York,	7	0	7
Grand total,	138	118	256

CLASSIFICATION OF MODERATELY ADVANCED PATIENTS DISCHARGED DURING 1911, PENNSYLVANIA STATE SOUTH MOUNTAIN SANATORIUM.

	White.	Black.	Male.	Female.	Married.	Single.	Total.	Per cent.
Patients discharged during year 1911,*	721	31	452	300	373	379	752	....
As apparently cured,	36	0	15	21	8	28	36	4.79
As "arrested."	230	5	118	117	100	135	235	31.25
As improved,	289	16	201	104	173	132	305	40.56
As progressive,	151	8	102	57	82	77	159	21.14
By death,	15	2	16	1	10	7	17	2.26
Gained in weight,	556	20	310	236	293	283	576	76.57
Lost in weight,	137	10	94	53	59	88	147	19.55
Unchanged in weight,	28	1	18	11	21	8	29	3.86

*1 Indian.

CLASSIFICATION OF MODERATELY ADVANCED PATIENTS DISCHARGED FROM PENNSYLVANIA STATE SOUTH MOUNTAIN SANATORIUM DURING 1911, REMAINING UNDER TREATMENT FOR LESS THAN THREE MONTHS.

	White.	Black.	Male.	Female.	Married.	Single.	Total.	Per cent.
Patients discharged during year 1911, ..	238	17	170	85	158	97	255	....
As apparently cured,	0	0	0	0	0	0	0	....
As "arrested,"	21	0	9	12	11	10	21	8.23
As improved,	129	9	95	43	89	49	138	54.12
As progressive,	82	8	60	30	53	37	90	35.29
By death,	6	0	6	0	5	1	6	2.35
Gained in weight,	154	9	111	52	109	54	163	63.92
Lost in weight,	61	7	43	25	31	37	68	26.67
Unchanged in weight,	23	1	16	8	18	6	24	9.41

CLASSIFICATION OF MODERATELY ADVANCED PATIENTS DISCHARGED FROM PENNSYLVANIA STATE SOUTH MOUNTAIN SANATORIUM DURING 1911, REMAINING UNDER TREATMENT FROM THREE TO SIX MONTHS.

	White.	Black.	Male.	Female.	Married.	Single.	Total.	Per cent.
Patients discharged during year 1911,* .	343	11	207	147	171	183	354	....
As apparently cured,	20	0	10	10	5	15	20	5.65
As "arrested,"	147	4	81	70	76	75	151	42.65
As improved,	126	7	85	48	67	66	133	37.57
As progressive,	46	0	27	19	21	25	46	12.99
By death,	4	0	4	0	2	2	4	1.13
Gained in weight,	*291	10	175	126	150	151	301	85.01
Lost in weight,	48	1	30	19	19	30	49	13.84
Unchanged in weight,	4	0	2	2	2	2	4	1.13

*1 Indian

CLASSIFICATION OF MODERATELY ADVANCED PATIENTS DISCHARGED FROM PENNSYLVANIA STATE SOUTH MOUNTAIN SANATORIUM DURING 1911, REMAINING UNDER TREATMENT FROM SIX TO NINE MONTHS.

	White.	Black.	Male.	Female.	Married.	Single.	Total.	Per cent.
Patients discharged during year 1911, ..	82	2	39	45	26	58	84	....
As apparently cured,	9	0	4	5	1	8	9	10.71
As "arrested,"	43	1	19	25	10	34	44	52.38
As improved,	17	0	7	10	10	7	17	20.24
As progressive,	11	0	7	4	4	7	11	13.09
By death,	2	1	2	1	1	2	3	3.57
Gained in weight,	70	1	32	39	23	48	71	84.52
Lost in weight,	11	1	7	5	2	10	12	14.28
Unchanged in weight,	1	0	0	1	1	0	1	1.19

CLASSIFICATION OF MODERATELY ADVANCED PATIENTS DISCHARGED FROM PENNSYLVANIA STATE SOUTH MOUNTAIN SANATORIUM DURING 1911, REMAINING UNDER TREATMENT FROM NINE TO TWELVE MONTHS.

	White.	Black.	Male.	Female.	Married.	Single.	Total.	Per cent.
Patients discharged during year 1911, ..	25	0	14	11	6	19	25	....
As apparently cured, ...	3	0	1	2	0	3	3	12
As "arrested,"	7	0	3	4	0	7	7	28
As improved, ...	6	0	5	1	2	4	6	24
As progressive, ...	8	0	4	4	4	4	8	32
By death, ...	1	0	1	0	0	1	1	4
Gained in weight, ...	18	0	9	9	4	14	18	72
Lost in weight, ...	7	0	5	2	2	5	7	28
Unchanged in weight, ...	0	0	0	0	0	0	0	....

CLASSIFICATION OF MODERATELY ADVANCED PATIENTS DISCHARGED FROM PENNSYLVANIA STATE SOUTH MOUNTAIN SANATORIUM DURING 1911, REMAINING UNDER TREATMENT OVER ONE YEAR.

	White.	Black.	Male.	Female.	Married.	Single.	Total.	Per cent.
Patients discharged during year 1911, ..	33	1	22	12	12	22	34	....
As apparently cured, ...	4	0	0	4	2	2	4	11.76
As "arrested,"	12	0	6	6	3	9	12	35.29
As improved, ...	11	0	9	2	5	6	11	32.35
As progressive, ...	4	0	4	0	0	4	4	11.76
By death, ...	2	1	3	0	2	1	3	8.82
Gained in weight, ...	23	0	13	10	7	16	23	67.64
Lost in weight, ...	10	1	9	2	5	6	11	32.35
Unchanged in weight, ...	0	0	0	0	0	0	0	....

CIVIL CONDITION OF MODERATELY ADVANCED PATIENTS DISCHARGED DURING 1911.

	Male.	Female.	Total	Per cent.
Married, ...	206	118	324	43.08
Single, ...	226	153	379	50.40
Widowed, ...	18	29	47	6.25
Divorced, ...	2	0	2	.265
Grand total, ...	452	300	752	....

AGE INCIDENCE AND MORTALITY OF MODERATELY ADVANCED PATIENTS DISCHARGED FROM PENNSYLVANIA STATE SOUTH MOUNTAIN SANATORIUM DURING 1911.

	Age Incidence.				Mortality.			
	Male.	Female.	Total.	Per Cent.	Male.	Female.	Total.	Per Cent.
1 to 5 years inc.,	0	0	0	....	0	0	0	....
6 to 10 years inc.,	0	0	0	....	0	0	0	....
11 to 15 years inc.,	10	16	26	3.46	0	0	0	....
16 to 20 years inc.,	58	55	113	15.03	1	0	1	.132
21 to 30 years inc.,	155	136	291	38.70	5	1	6	.797
31 to 40 years inc.,	129	66	195	25.93	6	0	6	.797
41 to 50 years inc.,	74	23	97	12.90	3	0	3	.398
51 to 60 years inc.,	22	4	26	3.46	1	0	1	.132
61 to 70 years inc.,	3	0	3	0.40	0	0	0	....
71 to 80 years inc.,	1	0	1	.13	0	0	0	....
Grand total,	452	300	752	....	16	1	17	2.26

NATIVITY OF MODERATELY ADVANCED PATIENTS DISCHARGED DURING 1911.

	Male.	Female.	Total	Per cent.
United States,	347	242	589	78.32
England,	13	7	20	2.66
Ireland,	24	10	34	4.52
Austria,	11	4	15	1.99
Germany,	10	12	22	2.92
Roumania,	3	2	5	0.66
Russia,	18	7	25	3.32
Sweden,	2	0	2	0.27
Italy,	3	2	5	0.66
Norway,	1	1	2	0.27
Turkey,	0	1	1	0.13
Poland,	2	0	2	0.27
Wales,	2	0	2	0.27
Scotland,	2	3	5	0.66
Switzerland,	0	1	1	0.13
Hungary,	2	2	4	0.53
S. America,	0	1	1	0.13
France,	0	1	1	0.13
Greece,	1	0	1	0.13
Canada,	1	0	1	0.13
Porto Rico,	0	1	1	0.13
Unknown,	10	3	13	1.73
Grand total,	452	300	752	....

PATERNAL NATIVITY OF MODERATELY ADVANCED PATIENTS DISCHARGED DURING 1911.

Father born in	Male.	Female.	Total.	Per cent.
United States,	212	161	373	49.60
England,	21	17	38	5.05
Ireland,	65	39	104	13.82
Austria,	12	7	19	2.52
Germany,	45	35	80	10.63
Roumania,	3	1	4	.532

PATERNAL NATIVITY OF MODERATELY ADVANCED PATIENTS DISCHARGED DURING 1911.—Continued.

Father born in	Male.	Female.	Total.	Per cent.
Russia,	24	7	31	4.12
Sweden,	3	0	3	.399
Italy,	11	4	15	1.99
Norway,	1	1	2	2.66
Denmark,	0	1	1	.13
Poland,	3	1	4	.53
Wales,	7	4	11	1.46
Scotland,	6	4	10	1.33
Switzerland,	3	1	4	.53
Hungary,	3	2	5	.66
Holland,	0	0	0	....
France,	3	0	3	.399
Bohemia,	0	0	0	....
Canada,	3	0	3	.399
Port Rico,	0	0	0	....
South America,	0	1	1	.13
Nova Scotia,	1	1	2	.266
Unknown,	25	12	37	4.92
Greece,	0	1	1	.13
Turkey,	0	1	1	.13
Grand total,	452	300	752	....

MATERNAL NATIVITY OF MODERATELY ADVANCED PATIENTS DISCHARGED DURING 1911.

Mother born in	Male.	Female.	Total.	Per cent.
United States,	210	176	386	51.33
England,	25	14	39	5.19
Ireland,	75	33	108	14.36
Austria,	12	4	16	2.13
Germany,	39	28	67	8.91
Roumania,	3	0	3	.399
Russia,	21	6	27	3.59
Sweden,	4	0	4	.53
Italy,	11	4	15	1.99
Norway,	1	1	2	2.66
Denmark,	0	0	0	....
Poland,	3	1	4	.532
Wales,	3	3	6	.798
Scotland,	8	7	15	1.99
Switzerland,	0	1	1	.13
Hungary,	3	2	5	.66
Holland,	0	0	0	....
France,	2	0	2	.26
Bohemia,	0	0	0	....
Canada,	2	1	3	.399
Porto Rico,	0	0	0	....
South America,	0	1	1	.13
Nova Scotia,	0	0	0	....
Unknown,	29	17	46	6.11
Greece,	1	0	1	.13
Turkey,	0	1	1	.13
Grand total,	452	300	752	....

CLASSIFICATION OF MODERATELY ADVANCED PATIENTS DISCHARGED IN 1911—BY DISPENSARIES.

Dispensary.	Male.	Female.	Total.	Dispensary.	Male.	Female.	Total.
1	7	14	21	61	....	....	....
2	7	6	13	62	1	0	1
3	9	3	12	63	1	0	1
4	1	2	3	64	0	4	4
5	0	1	1	65	....	....	....
6	....	....	....	66	8	2	10
7	....	....	....	67	4	1	5
8	....	....	....	68	5	4	9
9	8	5	13	69	1	0	1
10	2	0	2	70	3	3	6
11	11	3	14	71	3	1	4
12	11	3	14	72	....	....	....
13	19	10	29	73	1	2	3
14	8	4	12	74	....	....	....
15	4	4	8	75	0	1	1
16	0	2	2	76	0	0	0
17	0	0	0	77	2	2	4
18	0	1	1	78	....	....	....
19	....	....	....	79	....	....	....
20	50	30	80	80	2	2	4
21	148	81	229	81	7	2	9
22	1	0	1	82	....	....	....
23	1	0	1	83	....	....	....
24	....	....	....	84	1	0	1
25	1	0	1	85	2	1	3
26	2	1	3	86	0	1	1
27	0	1	1	87	....	....	....
28	2	0	2	88	3	1	4
29	....	....	....	89	1	0	1
30	1	0	1	90	....	....	....
31	3	4	7	91	....	....	....
32	5	7	12	92	....	....	....
33	10	5	15	93	1	1	2
34	....	....	....	94	1	1	2
35	4	0	4	95	1	2	3
36	4	0	4	96	....	....	....
37	4	1	5	97	....	....	....
38	2	0	2	98	3	3	6
39	6	4	10	99	3	0	3
40	8	4	12	100	2	1	3
41	1	0	1	101	5	4	9
42	2	0	2	102	0	1	1
43	1	0	1	103	1	1	2
44	1	0	1	104	0	1	1
45	....	....	....	105	5	3	8
46	0	2	2	106	2	0	2
47	2	0	2	107	21	22	43
48	1	4	5	108	2	1	3
49	1	1	2	109	8	14	22
50	....	....	....	110	1	4	5
51	1	0	1	111	4	2	6
52	0	2	2	112	....	....	....
53	1	0	1	113	....	....	....
54	1	1	2	114	0	1	1
55	....	....	....	115	0	2	2
56	....	....	....				
57	0	3	3	Grand Total,	448	299	747
58	1	0	1	Unclassed, ..	4	1	5
59	....	....	....				
60	1	0	1	Total, ...	452	300	752

CLASSIFICATION OF MODERATELY ADVANCED CASES DISCHARGED DURING 1911—BY COUNTIES.

	Male.	Female.	Total.
Adams,	0	2	2
Allegheny,	71	56	127
Armstrong,	0	3	3
Beaver,	2	1	3
Bedford,	0	0	0
Berks,	4	0	4
Blair,	7	5	12
Bradford,	1	0	1
Bucks,	1	0	1
Butler,	4	4	8
Cambria,	9	4	13
Cameron,	......	......	......
Carbon,	1	0	1
Centre,	0	1	1
Chester,	0	1	1
Clarion,	1	0	1
Clearfield,	4	3	7
Clinton,	0	3	3
Columbia,	1	1	2
Crawford,	1	0	1
Cumberland,	1	2	3
Dauphin,	19	11	30
Delaware,	11	3	14
Elk,	2	0	2
Erie,	11	3	14
Fayette,	6	4	10
Forest,	0	0	0
Franklin,	3	2	5
Fulton,	0	0	0
Greene,	1	0	1
Huntingdon,	2	0	2
Indiana,	1	4	5
Jefferson,	1	3	4
Juniata,	2	1	3
Lackawanna,	8	4	12
Lancaster,	6	5	11
Lawrence,	4	0	4
Lebanon,	0	1	1
Lehigh,	1	0	1
Luzerne,	10	21	31
Lycoming,	10	3	13
McKean,	3	2	5
Mercer,	4	0	4
Mifflin,	2	0	2
Monroe,	0	0	0
Montgomery,	8	8	16
Montour,	2	0	2
Northampton,	3	5	8
Northumberland,	5	4	9
Perry,	1	0	1
Philadelphia,	170	100	270
Pike,	......	......	......
Potter,	0	1	1
Schuylkill,	9	4	13
Snyder,	......	......	......
Somerset,	2	1	3
Sullivan,	......	......	......
Susquehanna,	2	1	3
Tioga,	1	1	2
Union,	0	0	0
Venango,	5	6	11
Warren,	2	1	3
Washington,	9	4	13
Wayne,	0	1	1
Westmoreland,	8	4	12
Wyoming,	2	0	2
York,	7	6	13
Grand Total,	451	300	751
1 Adm. from Sanatorium,	1	0	1

CLASSIFICATION OF FAR ADVANCED PATIENTS DISCHARGED FROM PENNSYLVANIA STATE SOUTH MOUNTAIN SANATORIUM DURING 1911.

	White.	Black.	Male.	Female.	Married.	Single.	Total.	Per cent.
Patients discharged during year 1911, ...	1059	55	700	414	518	596	1114	......
As apparently cured, ...	3	0	2	1	0	3	3	.27
As "Arrested,"	151	5	80	76	66	90	156	14.00
As improved, ...	312	15	216	111	178	149	327	29.35
As progressive, ...	409	16	262	163	194	231	425	38.15
By death, ...	184	19	140	63	80	123	203	18.22
Gained in weight, ...	553	22	351	224	290	285	575	51.61
Lost in weight, ...	418	28	281	165	185	261	446	40.03
Unchanged in weight, ...	72	5	62	15	36	41	77	6.91
Too ill to be weighed, ...	16	0	6	10	7	9	16	1.43

CLASSIFICATION OF FAR ADVANCED PATIENTS DISCHARGED FROM PENNSYLVANIA STATE SOUTH MOUNTAIN SANATORIUM DURING 1911, REMAINING UNDER TREATMENT LESS THAN THREE MONTHS.

	White.	Black.	Male.	Female.	Married.	Single.	Total.	Per cent.
Patients discharged during year 1911, ...	446	29	321	154	246	229	475	......
As apparently cured, ...	0	0	0	0	0	0	0	......
As "Arrested,"	5	0	3	2	3	2	5	1.05
As improved, ...	104	4	72	36	79	29	108	22.74
As progressive, ...	218	11	153	76	106	123	229	48.21
By death, ...	119	14	93	40	58	75	133	28.00
Gained in weight, ...	165	7	116	56	110	62	172	36.21
Lost in weight, ...	204	17	143	78	97	124	221	46.53
Unchanged in weight, ...	62	5	56	11	32	35	67	14.10
Too ill to be weighed, ...	15	0	6	9	7	8	15	3.16

CLASSIFICATION OF FAR ADVANCED PATIENTS DISCHARGED FROM PENNSYLVANIA STATE SOUTH MOUNTAIN SANATORIUM DURING 1911, REMAINING UNDER TREATMENT FROM THREE TO SIX MONTHS.

	White.	Black.	Male.	Female.	Married.	Single.	Total.	Per cent.
Patients discharged during year 1911, ...	362	20	223	159	190	192	382	......
As apparently cured, ...	1	0	0	1	0	1	1	.26
As "Arrested,"	76	3	39	40	41	38	79	20.68
As improved, ...	129	8	91	46	75	62	137	35.86
As progressive, ...	131	4	73	62	62	73	135	35.34
By death, ...	25	5	20	10	12	18	30	7.85
Gained in weight, ...	231	10	140	101	123	118	241	63.09
Lost in weight, ...	127	10	81	56	66	71	137	35.86
Unchanged in weight, ...	3	0	2	1	1	2	3	.785
Too ill to be weighed, ...	1	0	0	1	0	1	1	.261

CLASSIFICATION OF FAR ADVANCED PATIENTS DISCHARGED FROM PENNSYLVANIA STATE SOUTH MOUNTAIN SANATORIUM DURING 1911, REMAINING UNDER TREATMENT FROM SIX TO NINE MONTHS.

	White.	Black.	Male.	Female.	Married.	Single.	Total.	Per cent.
Patients discharged during year 1911, ...	127	1	76	52	49	79	128	......
As apparently cured, ...	1	0	1	0	0	1	1	.78
As "Arrested,"	31	1	14	18	12	20	32	23.91
As improved, ...	45	0	30	15	15	30	45	35.16
As progressive, ...	31	0	19	12	16	15	31	23.21
By death, ...	19	0	12	7	6	13	19	14.84
Gained in weight, ...	80	1	47	34	31	50	81	63.28
Lost in weight, ...	44	0	27	17	15	29	44	31.37
Unchanged in weight, ...	3	0	2	1	3	0	3	2.24

CLASSIFICATION OF FAR ADVANCED PATIENTS DISCHARGED FROM PENNSYLVANIA STATE SOUTH MOUNTAIN SANATORIUM DURING 1911, REMAINING UNDER TREATMENT FROM NINE TO TWELVE MONTHS.

	White.	Black.	Male.	Female.	Married.	Single.	Total.	Per cent.
Patients discharged during year 1911, ...	55	3	33	25	18	40	58	......
As apparently cured, ...	1	0	1	0	0	1	1	1.72
As "Arrested,"	16	0	10	6	4	12	16	27.59
As improved, ...	15	3	12	6	7	11	18	31.03
As progressive, ...	17	0	6	11	7	10	17	29.31
By death, ...	6	0	4	2	0	6	6	10.34
Gained in weight, ...	39	3	22	20	15	27	42	72.41
Lost in weight, ...	16	0	11	5	3	13	16	27.59
Unchanged in weight, ...	0	0	0	0	0	0	0	......

CLASSIFICATION OF FAR ADVANCED PATIENTS DISCHARGED FROM PENNSYLVANIA STATE SOUTH MOUNTAIN SANATORIUM DURING 1911, REMAINING UNDER TREATMENT OVER ONE YEAR.

	White.	Black.	Male.	Female.	Married.	Single.	Total.	Per cent.
Patients discharged during year 1911, ...	69	2	47	24	15	56	71	......
As apparently cured, ...	0	0	0	0	0	0	0	......
As "Arrested,"	23	1	14	10	6	18	24	33.80
As improved, ...	19	0	11	8	2	17	19	26.76
As progressive, ...	12	1	11	2	3	10	13	19.71
By death, ...	15	0	11	4	4	11	15	21.13
Gained in weight, ...	39	1	26	14	11	29	40	56.34
Lost in weight, ...	29	1	20	10	4	26	30	42.25
Unchanged in weight, ...	1	0	1	0	0	1	1	1.41

CIVIL CONDITION OF FAR ADVANCED PATIENTS DISCHARGED DURING 1911.

	Male.	Female.	Total.	Per cent.
Married,	297	159	456	40.93
Single,	374	222	596	53.50
Widowed,	27	30	57	5.12
Divorced,	2	3	5	.45
Grand Total,	700	414	1114	....

AGE INCIDENCE AND MORTALITY OF FAR ADVANCED PATIENTS DISCHARGED DURING 1911.

	Age Incidence.				Mortality.			
	Male.	Female.	Total.	Per cent.	Male.	Female.	Total.	Per cent.
1 to 5 years inclusive,	0	0	0	....	0	0	0	....
6 to 10 years inclusive,	0	0	0	....	0	0	0	....
11 to 15 years inclusive,	5	12	17	1.53	2	4	6	2.95
16 to 20 years inclusive,	74	75	149	13.37	16	14	30	14.78
21 to 30 years inclusive,	255	195	450	40.39	39	28	67	33.00
31 to 40 years inclusive,	211	91	302	27.11	46	10	56	27.59
41 to 50 years inclusive,	115	32	147	13.19	28	5	33	16.26
51 to 60 years inclusive,	33	9	42	3.77	7	2	9	4.43
61 to 70 years inclusive,	7	0	7	.63	2	0	2	.98
Grand Total,	700	414	1114	....	140	63	203	....

NATIVITY OF FAR ADVANCED PATIENTS DISCHARGED DURING 1911.

	Male.	Female.	Total.	Per cent.
United States,	572	340	912	81.87
England,	11	3	14	1.26
Ireland,	34	16	50	4.49
Austria,	19	7	26	2.33
Germany,	18	16	34	3.05
Roumania,	1	0	1	.09
Russia,	11	8	19	1.70
Sweden,	1	4	5	.45
Italy,	7	6	13	1.17
Norway,	2	0	2	.18
Denmark,	1	1	2	.18
Poland,	6	0	6	.54
Wales,	3	3	6	.54
Scotland,	3	3	6	.54
Switzerland,	1	1	2	.18
Hungary,	2	3	5	.45
Holland,	0	0	0	....
Canada,	2	1	3	.27
Turkey,	2	0	2	.18
Unknown,	4	2	6	.54
Grand Total,	700	414	1114	....

PARENTAL NATIVITY OF FAR ADVANCED PATIENTS DISCHARGED DURING 1911.

Father Born in	Male.	Female.	Total.	Per cent.	Mother Born in	Male.	Female.	Total.	Per cent.
United States, ...	338	205	543	48.74	United States, ...	338	228	566	50.81
England, ...	32	17	49	4.40	England, ...	28	18	46	4.13
Ireland, ...	132	69	201	18.04	Ireland, ...	130	53	183	16.43
Austria, ...	20	9	29	2.60	Austria, ...	20	6	26	2.33
Germany, ...	79	45	124	11.13	Germany, ...	71	30	101	9.06
Russia, ...	14	8	22	1.97	Russia, ...	14	8	22	1.97
Italy, ...	14	9	23	2.06	Italy, ...	13	8	21	1.89
Hungary, ...	3	3	6	.54	Hungary, ...	3	2	5	.45
Sweden, ...	2	6	8	.72	Sweden, ...	4	6	10	.90
Poland, ...	7	0	7	.63	Poland, ...	7	0	7	.63
Australia, ...	0	0	0	......	Australia, ...	0	0	0	......
Holland, ...	0	1	1	.09	Holland, ...	0	1	1	.09
Scotland, ...	12	8	20	1.79	Scotland, ...	10	12	22	1.97
Wales, ...	5	7	12	1.08	Wales, ...	8	7	15	1.35
Bohemia, ...	1	0	1	.09	Bohemia, ...	0	0	0	......
Norway, ...	2	0	2	.18	Norway, ...	2	0	2	.18
Canada, ...	2	2	4	.36	Canada, ...	2	1	3	.27
Spain, ...	......	......	......	......	Spain, ...	......	......	......	......
France, ...	2	1	3	.27	France, ...	2	0	2	.18
Roumania, ...	1	0	1	.08	Roumania, ...	1	0	1	.09
Portugal, ...	......	......	......	......	Portugal, ...	......	......	......	......
Belgium, ...	......	......	......	......	Belgium, ...	......	......	......	......
Switzerland, ...	1	1	2	.18	Switzerland, ...	1	2	3	.27
Philippines, ...	1	0	1	.09	Phillipines, ...	1	0	1	.09
South America, ...	......	......	......	......	South America, ...	......	......	......	......
Denmark, ...	2	2	4	.36	Denmark, ...	0	2	2	.18
Turkey, ...	2	0	2	.18	Turkey, ...	2	0	2	.18
Unknown, ...	28	21	49	4.40	Unknown, ...	43	30	73	6.55
Grand Total,	700	414	1114	......	Grand Total,	700	414	1114	......

FAR ADVANCED PATIENTS DISCHARGED DURING 1911—BY COUNTIES.

Counties.	Male.	Female.	Total.
Adams, ...	2	2	4
Allegheny, ...	96	67	163
Armstrong, ...	4	1	5
Beaver, ...	10	3	13
Bedford, ...	1	3	4
Berks, ...	3	5	8
Blair, ...	10	3	13
Bradford, ...	0	0	0
Bucks, ...	9	2	11
Butler, ...	2	3	5
Cambria, ...	10	3	13
Cameron, ...	0	0	0
Carbon, ...	3	0	3
Centre, ...	1	2	3
Chester, ...	8	5	13
Clarion, ...	4	2	6
Clearfield, ...	2	3	5
Clinton, ...	3	2	5
Columbia, ...	3	0	3
Crawford, ...	4	1	5
Cumberland, ...	2	2	4
Dauphin, ...	13	15	28
Delaware, ...	15	8	23
Elk, ...	2	2	4
Erie, ...	15	7	22
Fayette, ...	12	11	23
Forest, ...	1	0	1
Franklin, ...	3	0	3
Fulton, ...	0	0	0
Greene, ...	0	0	0
Huntingdon, ...	4	2	6
Indiana, ...	7	6	13
Jefferson, ...	5	2	7

FAR ADVANCED PATIENTS DISCHARGED DURING 1911—BY COUNTIES—Continued.

Counties.	Male.	Female.	Total.
Juniata,	0	0	0
Lackawanna,	15	9	24
Lancaster,	8	4	12
Lawrence,	7	3	10
Lebanon,	0	1	1
Lehigh,	2	1	3
Luzerne,	23	20	43
Lycoming,	10	9	19
McKean,	1	1	2
Mercer,	2	0	2
Mifflin,	3	2	5
Monroe,	1	1	2
Montgomery,	9	3	12
Montour,	1	1	2
Northampton,	12	7	19
Northumberland,	7	9	16
Perry,	0	2	2
Philadelphia,	279	139	418
Potter,	1	2	3
Schuylkill,	21	8	29
Snyder,	0	0	0
Sullivan,	0	0	0
Somerset,	2	0	2
Susquehanna,	0	1	1
Tioga,	1	0	1
Venango,	4	3	7
Union,	1	0	1
Warren,	0	0	0
Washington,	14	7	21
Wayne,	1	0	1
Westmoreland,	15	11	26
Wyoming,	0	0	0
York,	6	8	14
Grand Total,	700	414	1114

FAR ADVANCED PATIENTS DISCHARGED DURING 1911, ADMITTED FROM THE FOLLOWING DISPENSARIES.

	Male.	Female.	Total.		Male.	Female.	Total.
1	17	13	30	30	1	0	1
2	7	7	14	31	5	2	7
3	14	7	21	32	6	4	10
4	0	2	2	33	10	8	18
5	0	1	1	34	0	0	0
6	8	4	12	35	6	4	10
7	1	2	3	36	1	0	1
8	0	0	0	37	3	4	7
9	8	3	11	38	2	1	3
10	3	2	5	39	5	4	9
11	3	1	4	40	16	10	26
12	13	6	19	41	3	1	4
13	13	16	29	42	2	1	3
14	10	3	13	43	1	1	2
15	2	3	5	44	1	0	1
16	1	0	1	45	1	0	1
17	....	....	....	46	2	1	3
18	1	0	1	47	4	2	6
19	....	....	....	48	7	6	13
20	69	40	109	49	0	1	1
21	223	116	339	50	0	0	0
22	5	1	6	51	1	1	2
23	3	0	3	52	5	0	5
24	5	2	7	53	2	1	3
25	1	1	2	54	1	0	1
26	....	....	....	55	6	2	8
27	1	2	3	56	0	0	0
28	0	1	1	57	6	3	9
29	....	....	....	58	2	0	2

FAR ADVANCED PATIENTS DISCHARGED DURING 1911, ADMITTED FROM THE FOLLOWING DISPENSARIES—Continued.

	Male.	Female.	Total.		Male.	Female.	Total.
59	0	0	0	89	1	0	1
60	2	2	4	90	1	0	1
61	0	3	3	91	0	0	0
62	1	2	3	92	0	3	3
63	0	0	0	93	2	0	2
64	4	1	5	94	1	0	1
65	1	1	2	95	2	1	3
66	9	3	12	96	2	[illegible]	2
67	11	5	16	97	0	0	0
68	4	5	9	98	7	6	13
69	2	1	3	99	0	0	0
70	1	4	5	100	4	3	7
71	6	4	10	101	11	5	16
72	0	0	0	102	0	1	1
73	4	1	5	103	5	1	6
74	1	0	1	104	0	0	0
75	0	1	1	105	7	3	10
76	0	0	0	106	1	0	1
77	3	3	6	107	58	28	86
78	1	0	1	108	0	0	0
79	0	0	0	109	5	7	12
80	1	1	2	110	1	1	2
81	6	5	11	111	2	7	9
82	5	2	7	112	1	1	2
83	1	1	2	113	3	1	4
84	0	0	0	114	0	1	1
85	9	4	13	115	0	0	0
86	0	0	0				
87	1	0	1	Grand Total,	698	413	1111
88	4	5	9	Adm. Emp. List	2	1	3
					700	414	1114

CLASSIFICATION OF PATIENTS DISCHARGED FROM PENNSYLVANIA STATE SOUTH MOUNTAIN SANATORIUM DURING 1911, REMAINING UNDER TREATMENT LESS THAN THREE MONTHS.

	White.	Black.	Male.	Female.	Married.	Single.	Total.	Per cent.
Patients discharged during year 1911,	779	47	550	276	449	377	826	......
As apparently cured,	0	0	0	0	0	0	0	......
As "arrested,"	37	0	18	19	21	16	37	4.48
As improved,	307	13	214	106	199	121	320	38.74
As progressive,	310	20	219	111	166	164	330	39.95
By death,	125	14	99	40	63	76	139	16.82
Gained in weight,	397	16	276	137	253	160	413	50.00
Lost in weight,	272	25	189	108	134	163	297	35.95
Unchanged in weight,	95	6	79	22	55	46	101	12.22
Too ill to be weighed,	15	0	6	9	7	8	15	1.81

CLASSIFICATION OF PATIENTS DISCHARGED FROM PENNSYLVANIA STATE SOUTH MOUNTAIN SANATORIUM DURING 1911, REMAINING UNDER TREATMENT FROM THREE TO SIX MONTHS.

	White.	Black.	Male.	Female.	Married.	Single.	Total.	Per cent.
Patients discharged during year 1911, ...	818	35	494	359	398	455	853	......
As apparently cured, ...	38	1	20	19	12	27	39	4.57
As "arrested, ...	284	10	158	136	136	158	294	34.46
As improved, ...	°288	15	191	112	152	150	303	35.52
As progressive, ...	179	4	101	82	83	100	183	21.45
By death, ...	29	5	24	10	14	20	34	3.98
Gained in weight, ...	‡628	24	378	274	309	343	652	76.43
Lost in weight, ...	180	11	111	80	86	105	191	22.39
Unchanged in weight.	9	0	5	4	3	6	9	1.05
‡ 1 Too ill to be weighed, ...	1	0	0	1	0	1	1	.11
° 1 Indian.								

CLASSIFICATION OF PATIENTS DISCHARGED FROM PENNSYLVANIA STATE SOUTH MOUNTAIN SANATORIUM DURING 1911, REMAINING UNDER TREATMENT FROM SIX TO NINE MONTHS.

	White.	Black.	Male.	Female.	Married.	Single.	Total.	Per cent.
Patients discharged during year 1911.	232	5	121	116	82	155	237	......
As apparently cured.	17	1	8	10	2	16	18	7.59
As "arrested,"	86	2	35	53	25	63	88	37.13
As improved, ...	66	0	38	28	27	39	66	27.84
As progressive, ...	42	1	26	17	21	22	43	18.14
By death, ...	21	1	14	8	7	15	22	9.28
Gained in weight.	171	3	84	90	60	114	174	73.41
Lost in weight, ...	57	2	35	24	18	41	59	24.89
Unchanged in weight, ...	4	0	2	2	4	0	4	1.68

CLASSIFICATION OF PATIENTS DISCHARGED FROM PENNSYLVANIA STATE SOUTH MOUNTAIN SANATORIUM DURING 1911, REMAINING UNDER TREATMENT FROM NINE TO TWELVE MONTHS.

	White.	Black.	Male.	Female.	Married.	Single.	Total.	Per cent.
Patients discharged during year 1911, ...	91	4	53	42	24	71	95	......
As apparently cured, ...	7	0	4	3	0	7	7	7.36
As "arrested,"	26	1	14	13	4	23	27	28.42
As improved, ...	24	3	19	8	9	18	27	28.42
As progressive, ...	27	0	11	16	11	16	27	28.42
By death, ...	7	0	5	2	0	7	7	7.36
Gained in weight, ...	65	3	35	33	19	49	68	71.57
Lost in weight, ...	26	1	18	9	5	22	27	28.42
Unchanged in weight, ...	0	0	0	0	0	0	0	......

CLASSIFICATION OF PATIENTS DISCHARGED FROM PENNSYLVANIA STATE SOUTH MOUNTAIN SANATORIUM DURING 1911, REMAINING UNDER TREATMENT OVER ONE YEAR.

	White.	Black.	Male.	Female.	Married.	Single.	Total.	Per cent.
Patients discharged during year 1911, ...	108	3	72	39	28	83	111	......
As apparently cured, ...	5	0	0	5	2	3	5	4.50
As "arrested,"	39	1	22	18	10	30	40	36.03
As improved, ...	30	0	20	10	7	23	30	27.02
As progressive, ...	17	1	16	2	3	15	18	16.21
By death, ...	17	1	14	4	6	12	18	16.21
Gained in weight, ...	68	1	42	27	19	50	69	62.16
Lost in weight, ...	39	2	29	12	9	32	41	36.93
Unchanged in weight, ...	1	0	1	0	0	1	1	.90

CIVIL CONDITION OF PATIENTS DISCHARGED DURING 1911.

	Male.	Female.	Total.	Per cent.
Married, ...	555	299	854	40.24
Single, ...	680	461	1141	53.77
Widowed, ...	51	69	120	5.65
Divorced, ...	4	3	7	.32
Grand total, ...	1290	832	2122	....

AGE INCIDENCE AND MORTALITY OF PATIENTS DISCHARGED DURING 1911.

	Age Incidence.				Mortality.			
	Male.	Female.	Total.	Per cent.	Male.	Female.	Total.	Per cent.
1 to 5 years inclusive, ...	0	0	0	......	0	0	0	......
6 to 10 years inclusive, ...	0	0	0	......	0	0	0	......
11 to 15 years inclusive, ...	27	42	69	3.25	2	5	7	.32
16 to 20 years inclusive, ...	165	169	334	15.73	17	13	30	1.41
21 to 30 years inclusive, ...	460	375	835	39.35	44	29	73	3.41
31 to 40 years inclusive, ...	367	175	542	25.59	52	10	62	2.92
41 to 50 years inclusive, ...	200	58	258	12.11	31	5	36	1.69
51 to 60 years inclusive, ...	60	13	73	3.14	8	2	10	.47
61 to 70 years inclusive, ...	10	0	10	47	2	0	2	.09
71 to 80 years inclusive.	1	0	1	04	0	0	0	......
Grand total, ...	1290	832	2122	......	156	64	220	......
Unclassified, ...	17	2	19	......	......	......	......	......
	1307	834	2141	......	......	......	......	......

NATIVITY OF PATIENTS DISCHARGED DURING 1911.

	Male.	Female.	Total.	Per cent.
United States,	1031	687	1718	80.96
England,	26	11	37	1.74
Ireland,	63	29	92	4.33
Austria,	32	11	43	2.03
Germany,	30	29	59	2.78
Russia,	32	17	49	2.31
Italy,	12	10	22	1.04
Hungary,	5	5	10	.47
Sweden,	3	4	7	.33
Poland,	10	2	12	.56
Turkey,	2	1	3	.14
Scotland,	6	7	13	.61
Wales,	7	4	11	.52
Greece,	1	0	1	.05
Norway,	3	1	4	.19
Canada,	4	1	5	.23
France,	0	1	1	.05
Roumania,	5	2	7	.33
Switzerland,	1	2	3	.14
South America,	0	1	1	.05
Denmark,	1	1	2	.09
Porto Rico,	0	1	1	.05
Belgium,	1	0	1	.05
Unknown,	15	5	20	.94
Grand total,	1290	832	2122	....
Unclassified—(Compare the Summary on page 949.)				
United States,	15	1	16	....
England,	1	0	1	....
Ireland,	0	1	1	....
Siberia,	1	0	1	....
Total,	17	2	19	....

PARENTAL NATIVITY OF PATIENTS DISCHARGED DURING 1911.

Father Born in	Male.	Female.	Total.	Per cent.	Mother Born in	Male.	Female.	Total.	Per cent.
United States,	620	426	1046	49.29	United States,	623	468	1091	51.41
England,	60	40	100	4.71	England,	58	37	95	4.48
Ireland,	219	123	342	16.11	Ireland,	226	99	325	15.31
Austria,	34	16	50	2.35	Austria,	33	10	43	2.02
Germany,	135	91	226	10.65	Germany,	120	66	186	8.76
Russia,	43	18	61	2.87	Russia,	40	16	56	2.63
Italy,	28	18	46	2.16	Italy,	27	16	43	2.02
Hungary,	6	6	12	.56	Hungary,	6	5	11	.52
Sweden,	6	6	12	.56	Sweden,	9	6	15	.70
Poland,	12	2	14	.65	Poland,	12	2	14	.65
Australia,	0	0	0	......	Australia,	0	0	0	......
Holland,	0	1	1	.04	Holland,	0	1	1	.04
Scotland,	18	14	32	1.51	Scotland,	18	22	40	1.88
Wales,	15	13	28	1.31	Wales,	13	13	26	1.22
Turkey,	2	1	3	.14	Turkey,	2	1	3	.14
Norway,	3	1	4	.18	Norway,	3	1	4	.18
Canada,	6	5	11	.52	Canada,	6	5	11	.52
Greece,	1	0	1	.04	Greece,	1	0	1	.04
France,	5	2	7	.32	France,	4	0	4	.18
Roumania,	4	1	5	.23	Roumania,	4	0	4	.18
Nova Scotia,	1	1	2	.09	Nova Scotia,	0	0	0	......
South America,	0	1	1	.04	South America,	0	1	1	.04
Phillipines,	1	0	1	.04	Phillipines,	1	0	1	.04
Belgium,	1	0	1	.04	Belgium,	1	0	1	.04
Switzerland,	4	2	6	.28	Switzerland,	1	3	4	.18
Bohemia,	1	0	1	.04	Bohemia,	0	0	0	......
Denmark,	2	3	5	.23	Denmark,	0	2	2	.09
Porto Rico,	0	0	0	......	Porto Rico,	0	0	0	......
Sicily,	0	0	0	......	Sicily,	0	0	0	......
Unknown,	63	41	104	4.90	Unknown,	82	58	140	6.60
					Grand total,	1290	832	2122	......

CLASSIFICATION OF PATIENTS DISCHARGED DURING 1911—BY DISPENSARIES.

Dispensary.	Male.	Female.	Total.
1	31	35	66
2	20	13	33
3	23	13	36
4	1	4	5
5	0	2	2
6	8	4	12
7	1	2	3
8	0	0	0
9	19	8	27
10	5	2	7
11	4	3	7
12	27	9	36
13	43	35	78
14	20	10	30
15	8	8	16
16	1	2	3
17	0	0	0
18	1	1	2
19	0	0	0
20	129	82	211
21	412	231	643
22	6	1	7
23	4	1	5
24	5	2	7
25	2	1	3
26	2	1	3
27	1	3	4
28	2	2	4
29	0	0	0
30	2	0	2
31	8	6	14
32	12	12	24
33	21	14	35
34	0	0	0
35	10	4	14
36	5	0	5
37	9	5	14
38	4	1	5
39	13	9	22
40	28	15	43
41	4	1	5
42	4	2	6
43	2	1	3
44	2	0	2
45	1	0	1
46	2	3	5
47	6	3	9
48	8	10	18
49	1	3	4
50	0	0	0
51	2	1	3
52	5	2	7
53	3	1	4
54	2	1	3
55	6	2	8
56	0	0	0
57	7	7	14
58	3	0	3
59	1	0	1
60	4	3	7
61	1	3	4
62	3	2	5
63	1	0	1
64	5	6	11
65	2	1	3
66	19	7	26
67	15	7	22
68	15	16	31
69	3	2	5
70	4	10	14
71	9	6	15
72	0	0	0
73	5	3	8
74	1	0	1
75	1	2	3
76	0	0	0
77	6	5	11
78	1	0	1
79	0	0	0
80	3	3	6
81	15	7	22
82	5	3	8
83	2	1	3
84	1	0	1
85	12	6	18
86	0	1	1
87	2	0	2
88	7	7	14
89	2	1	3
90	1	1	2
91	0	0	0
92	0	3	3
93	3	1	4
94	3	1	4
95	3	3	6
96	3	0	3
97	0	0	0
98	10	9	19
99	3	0	3
100	7	4	11
101	17	10	27
102	0	2	2
103	6	2	8
104	1	1	2
105	14	8	22
106	3	0	3
107	86	54	140
108	2	1	3
109	20	28	48
110	2	6	8
111	6	9	15
112	1	1	2
113	3	1	4
114	0	2	2
115	0	2	2
	1284	829	2113
Emp. list and not given, ...	6	3	9
Grand total, ...	1290	832	2122

CLASSIFICATION OF PATIENTS DISCHARGED DURING 1911—COUNTIES

Counties.	Male.	Female.	Total.	Counties.	Male.	Female.	Total.
Adams,	3	5	8	Lawrence,	11	3	14
Allegheny,	188	143	331	Lebanon,	0	2	2
Armstrong,	4	4	8	Lehigh,	3	1	4
Beaver,	12	5	17	Luzerne,	45	57	102
Bedford,	2	3	5	Lycoming,	21	13	34
Berks,	9	5	14	McKean,	4	3	7
Blair,	19	11	30	Mercer,	6	0	6
Bradford,	1	0	1	Mifflin,	5	2	7
Bucks,	10	4	14	Monroe,	2	1	3
Butler,	8	8	16	Montgomery,	17	11	28
Cambria,	22	8	30	Montour,	3	2	5
Cameron,	0	0	0	Northampton,	16	12	28
Carbon,	4	1	5	Northumberland,	12	14	26
Centre,	1	3	4	Perry,	2	2	4
Chester,	9	6	15	Philadelphia,	497	277	774
Clarion,	5	2	7	Pike,	0	0	0
Clearfield,	7	6	13	Potter,	1	3	4
Clinton,	3	5	8	Schuylkill,	34	15	49
Columbia,	4	2	6	Snyder,	0	0	0
Crawford,	5	2	7	Somerset,	4	1	5
Cumberland,	4	4	8	Sullivan,	1	0	1
Dauphin,	41	35	76	Susquehanna,	2	3	5
Delaware,	29	11	40	Tioga,	3	1	4
Elk,	4	3	7	Union,	1	0	1
Erie,	26	13	39	Venango,	9	10	19
Fayette,	18	18	36	Warren,	2	1	3
Forest,	1	0	1	Washington,	26	13	39
Franklin,	6	2	8	Wayne,	1	1	2
Fulton,	0	0	0	Westmoreland,	25	17	42
Greene,	2	0	2	Wyoming,	2	0	2
Huntingdon,	6	3	9	York,	20	14	34
Indiana,	8	10	18				
Jefferson,	7	6	13	Grand total,	1289	832	2121
Juniata,	2	1	3				
Lackawanna,	27	14	41	Adm. from sanatorium,	1	......	1
Lancaster,	17	10	27		1290	832	2122

One male admitted from sanatorium employee list.

SUMMARY—1911.

	White.	Black.	Male.	Female.	Married.	Single.	Total.	Per cent.
Patients in Sanatorium Jan. 1, 1911,	......	......	438	301	......	......	739	......
Patients discharged during year 1911,	2028	94	1290	832	981	1141	2122	......
As apparently cured,	67	2	32	37	16	53	69	3.25
As "arrested,"	472	14	247	239	196	290	486	22.90
As improved,	715	31	482	264	395	351	746	35.15
As progressive,	575	26	373	228	284	317	601	28.32
By death,	199	21	156	64	90	130	220	10.36
Unclassified,§	17	2	17	2	13	6	19	......
Gained in weight,	1329	47	815	561	660	716	1376	64.84
Lost in weight,	574	41	382	233	252	363	615	28.98
Unchanged in weight,	109	6	87	28	62	53	115	5.41
Too ill to be weighed,	16	0	6	10	7	9	16	.75
Remaining Dec. 31, 1911,	......	......	449	299	......	......	748	......

§Deserted within a few days after admission, and prior to examination and classification.

REPORT ON THE RESULTS OBTAINED IN FIVE THOUSAND SEVEN HUNDRED AND TWENTY-EIGHT CASES DISCHARGED FROM THE MONT ALTO STATE SANATORIUM SINCE ITS BEGINNING IN 1907.

I. JUNE 1, 1907—May 31, 1908: INCIPIENT.

Result.	White	Black	Male	Female	Married	Single	Total	Per cent.
Apparently cured,	0	0	0	0	0	0	0	....
Arrested,	12	0	7	5	4	8	12	46.15
Improved,	11	0	10	1	5	6	11	42.30
Progressive,	3	0	1	2	1	2	3	11.53
Died,	0	0	0	0	0	0	0	....
Total,	26	0	18	8	10	16	26	....

MODERATELY ADVANCED.

Result.	White	Black	Male	Female	Married	Single	Total	Per cent.
Apparently cured,	0	0	0	0	0	0	0	....
Arrested,	24	1	14	11	9	16	25	41.64
Improved,	24	0	20	4	10	14	24	42.85
Progressive,	7	0	4	3	1	6	7	12.50
Died,	0	0	0	0	0	0	0	....
Total,	55	1	38	18	20	36	56	....

FAR ADVANCED.

Result.	White	Black	Male	Female	Married	Single	Total	Per cent.
Apparently cured,	0	0	0	0	0	0	0	....
Arrested,	0	0	0	0	0	0	0	....
Improved,	19	0	17	2	5	14	19	32.20
Progressive,	30	1	17	14	19	12	31	52.54
Died,	9	0	6	3	2	7	9	15.25
Total,	58	1	40	19	26	33	59	....

I. TOTAL—1907-1908.

Result.	White	Black	Male	Female	Married	Single	Total	Per cent.
Apparently cured,	0	0	0	0	0	0	0	....
Arrested,	36	1	21	16	13	24	37	26.24
Improved,	54	0	47	7	20	34	54	38.29
Progressive,	40	1	22	19	21	20	41	29.07
Died,	9	0	6	3	2	7	9	6.38
Total,	139	2	96	45	56	85	141	....

II. JUNE 1, 1908—MAY 31, 1909: INCIPIENT.

Result.	White	Black	Male	Female	Married	Single	Total	Per cent.
Apparently cured,	0	0	0	0	0	0	0	....
Arrested,	32	2	22	12	8	26	34	50.74
Improved,	25	3	21	7	11	17	28	41.77
Progressive,	5	0	4	1	2	3	5	7.46
Died,	0	0	0	0	0	0	0	....
Total,	62	5	47	20	21	46	67	....

MODERATELY ADVANCED.

Result.	White	Black	Male	Female	Married	Single	Total	Per cent.
Apparently cured,	0	0	0	0	0	0	0	....
Arrested,	59	0	39	20	20	39	59	23.41
Improved,	138	1	88	51	68	71	139	55.15
Progressive,	49	1	29	21	25	25	50	19.84
Died,	4	0	3	1	1	3	4	1.58
Total,	250	2	159	93	114	138	252	....

FAR ADVANCED.

Result.	White	Black	Male	Female	Married	Single	Total	Per cent.
Apparently cured,	0	0	0	0	0	0	0	....
Arrested,	32	0	30	2	8	24	32	11.85
Improved,	112	2	90	24	68	46	114	42.22
Progressive,	93	1	58	36	54	40	94	34.81
Died,	28	2	23	7	12	18	30	11.11
Total,	265	5	201	69	142	128	270	....

II. TOTAL—1908-1909.

Result.	White	Black	Male	Female	Married	Single	Total	Per cent.
Apparently cured,	0	0	0	0	0	0	0	....
Arrested,	123	2	91	34	36	89	125	21.22
Improved,	275	6	199	82	147	134	281	47.70
Progressive,	147	2	91	58	81	68	149	25.29
Died,	32	2	26	8	13	21	34	5.77
Total,	577	12	407	182	277	312	589	....

III. JUNE 1, 1909—DECEMBER 31, 1909: INCIPIENT.

Result.	White	Black	Male	Female	Married	Single	Total	Per cent.
Apparently cured, ...	0	0	0	0	0	0	0	....
Arrested, ...	37	0	26	11	6	31	37	36.27
Improved, ...	44	0	33	11	12	32	44	43.13
Progressive, ...	20	1	12	9	7	14	21	20.58
Died, ...	0	0	0	0	0	0	0	....
Total, ...	101	1	71	31	25	77	102	....

MODERATELY ADVANCED.

Result.	White	Black	Male	Female	Married	Single	Total	Per cent.
Apparently cured, ...	0	0	0	0	0	0	0	....
Arrested, ...	74	1	55	20	20	55	75	19.53
Improved, ...	234	2	136	100	112	124	236	61.45
Progressive, ...	68	2	43	27	31	39	70	18.22
Died, ...	1	2	3	0	2	1	3	.78
Total, ...	377	7	237	147	165	219	384	....

FAR ADVANCED.

Result.	White	Black	Male	Female	Married	Single	Total	Per cent.
Apparently cured, ...	0	0	0	0	0	0	0	....
Arrested, ...	33	2	22	13	15	20	35	6.86
Improved, ...	266	7	148	125	144	129	273	53.52
Progressive, ...	160	4	99	65	80	84	164	32.15
Died, ...	36	2	30	8	18	20	38	7.45
Total, ...	495	15	299	211	257	253	510	....

III. TOTAL—1909.

Result.	White	Black	Male	Female	Married	Single	Total	Per cent.
Apparently cured, ...	0	0	0	0	0	0	0	....
Arrested, ...	144	3	103	44	41	106	147	11.75
Improved, ...	544	9	317	236	268	285	553	55.52
Progressive, ...	248	7	154	101	118	137	255	25.60
Died, ...	37	4	33	8	20	21	41	4.11
Total, ...	973	23	607	389	447	549	996	....

IV. JANUARY 1, 1910—DECEMBER 31, 1910: INCIPIENT.

Result.	White	Black	Male	Female	Married	Single	Total	Per cent.
Apparently cured, ...	32	0	11	21	6	26	32	11.94
Arrested, ...	102	3	35	70	24	81	105	39.17
Improved, ...	101	2	55	48	43	60	103	38.43
Progressive, ...	23	3	16	10	10	16	26	9.70
Died, ...	2	0	2	0	2	0	2	.74
Total, ...	260	8	119	149	85	183	268	....

MODERATELY ADVANCED.

Result.	White	Black	Male	Female	Married	Single	Total	Per cent.
Apparently cured, ...	45	0	25	20	17	28	45	6.01
Arrested, ...	228	4	91	141	104	128	232	31.01
Improved, ...	327	7	219	115	184	150	334	44.65
Progressive, ...	120	1	79	42	49	72	121	16.17
Died, ...	15	1	11	5	4	12	16	2.13
Total, ...	735	13	425	323	358	390	748	....

FAR ADVANCED.

Result.	White	Black	Male	Female	Married	Single	Total	Per cent.
Apparently cured, ...	4	0	3	1	1	3	4	.46
Arrested, ...	107	3	66	44	37	73	110	12.73
Improved, ...	350	6	213	143	195	161	356	41.20
Progressive, ...	273	7	175	105	142	138	280	32.40
Died, ...	106	8	81	33	46	68	114	13.19
Total, ...	840	24	538	326	421	443	864	....

IV. TOTAL—1910.

Result.	White	Black	Male	Female	Married	Single	Total	Per cent.
Apparently cured, ...	81	0	39	42	24	57	81	4.30
Arrested, ...	437	10	192	255	165	282	447	23.77
Improved, ...	778	15	487	306	422	371	793	42.18
Progressive, ...	416	11	270	157	201	226	427	22.70
Died, ...	123	9	94	38	52	80	132	7.00
Total, ...	1835	45	1082	798	864	1016	1880	....

V. JANUARY 1, 1911—DECEMBER 31, 1911: INCIPIENT.

Result.	White	Black	Male	Female	Married	Single	Total	Per cent.
Apparently cured,	28	2	15	15	8	22	30	11.72
Arrested,	91	4	49	46	30	65	95	37.11
Improved,	114	0	65	49	44	70	114	44.53
Progresive,	15	2	9	8	8	9	17	6.64
Died,	0	0	0	0	0	0	0	....
Total,	248	8	138	118	90	166	256	....

MODERATELY ADVANCED.

Result.	White	Black	Male	Female	Married	Single	Total	Per cent.
Apparently cured,	36	0	15	21	8	28	36	4.79
Arrested,	230	5	118	117	100	135	235	31.25
Improved,	289	16	201	104	173	132	305	40.56
Progressive,	151	8	102	57	82	77	159	21.01
Died,	15	2	16	1	10	7	17	2.26
Total,	721	31	452	300	373	379	752	....

FAR ADVANCED.

Result.	White	Black	Male	Female	Married	Single	Total	Per cent.
Apparently cured,	3	0	2	1	0	3	3	.27
Arrested,	151	5	80	76	66	90	156	14.00
Improved,	312	15	216	111	178	149	327	29.35
Progressive,	409	16	262	163	194	231	425	38.15
Died,	184	19	140	63	80	123	203	18.22
Total,	1059	55	700	414	518	596	1114	....

V. TOTAL—1911.

Result.	White	Black	Male	Female	Married	Single	Total	Per cent.
Apparently cured,	67	2	32	37	16	53	69	3.25
Arrested,	472	14	247	239	196	290	486	22.90
Improved,	715	31	482	264	395	351	746	35.15
Progresive,	575	26	373	228	284	317	601	28.32
Died,	199	21	156	64	90	130	220	10.36
Total,	2028	94	1290	832	981	1141	2122	....

TOTAL INCIPIENT CASES 1907-1911.

Result.	White	Black	Male	Female	Married	Single	Total	Per cent.
Apparently cured,	60	2	26	36	14	48	62	8.62
Arrested,	274	9	139	144	72	211	283	39.36
Improved,	295	5	184	116	115	185	300	41.72
Progressive,	66	6	42	30	28	44	72	10.01
Died,	2	0	2	0	2	0	2	.27
Total,	697	22	393	326	231	488	719	....

TOTAL MODERATELY ADVANCED CASES 1907-1911.

Result.	White	Black	Male	Female	Married	Single	Total	Per cent.
Apparently cured,	81	0	40	41	25	56	81	3.69
Arrested,	615	11	317	309	253	373	626	28.55
Improved,	1012	26	664	374	547	491	1038	47.35
Progressive,	395	12	257	150	188	219	407	18.56
Died,	35	5	33	7	17	23	40	1.82
Total,	2138	54	1311	881	1030	1162	2192	....

TOTAL FAR ADVANCED CASES 1907-1911.

Result.	White	Black	Male	Female	Married	Single	Total	Per cent.
Apparently cured,	7	0	5	2	1	6	7	.24
Arrested,	323	10	198	135	126	207	333	11.82
Improved,	1059	30	684	405	590	499	1089	38.65
Progresive,	965	29	611	383	489	505	994	35.28
Died,	363	31	280	114	158	236	394	13.98
Total,	2717	100	1778	1039	1364	1453	2817	....

ANNUAL TOTAL. JUNE 1, 1907—MAY 31, 1908.

Result.	White	Black	Male	Female	Married	Single	Total	Per cent.
Apparently cured,	0	0	0	0	0	0	0	....
Arrested,	36	1	21	16	13	24	37	26.24
Improved,	54	0	47	7	20	34	54	38.29
Progressive,	40	1	22	19	21	20	41	29.07
Died,	9	0	6	3	2	7	9	6.38
Total,	139	2	96	45	56	85	141	....

ANNUAL TOTAL. MAY 31, 1908—JUNE 1, 1909.

Result.	White	Black	Male	Female	Married	Single	Total	Per cent.
Apparently cured,	0	0	0	0	0	0	0	....
Arrested,	123	2	91	34	36	89	125	21.22
Improved,	275	6	199	82	147	134	281	47.70
Progressive,	147	2	91	58	81	68	149	25.29
Died,	32	2	26	8	13	21	34	5.77
Total,	577	12	407	182	277	312	589	....

ANNUAL TOTAL. JUNE 1, 1909—DECEMBER 31, 1909.

Result.	White	Black	Male	Female	Married	Single	Total	Per cent.
Apparently cured,	0	0	0	0	0	0	0	....
Arrested,	144	3	103	44	41	106	147	14.75
Improved,	544	9	317	236	268	285	553	55.52
Progressive,	248	7	154	101	118	137	255	25.60
Died,	37	4	33	8	20	21	41	4.11
Total,	973	23	607	389	447	549	996	....

ANNUAL TOTAL. JANUARY 1, 1910—DECEMBER 31, 1910.

Result.	White	Black	Male	Female	Married	Single	Total	Per cent.
Apparently cured.	81	0	39	42	24	57	81	4.30
Arrested,	437	10	192	255	165	282	447	23.77
Improved,	778	15	487	306	422	371	793	42.18
Progressive,	416	11	270	157	201	226	427	22.70
Died,	123	9	94	38	52	80	132	7.00
Total,	1835	45	1082	798	864	1016	1880	....

ANNUAL TOTAL. JANUARY 1, 1911—DECEMBER 31, 1911.

Result.	White	Black	Male	Female	Married	Single	Total	Per cent.
Apparently cured,	67	2	32	37	16	53	69	3.25
Arrested,	472	14	247	239	196	290	486	22.90
Improved,	715	31	482	264	395	351	746	35.15
Progressive.	575	26	373	228	284	317	601	28.32
Died,	199	21	156	64	90	130	220	10 36
Total,	2028	94	1290	832	981	1141	2122	....

GRAND TOTAL.

1907-1911.

Result.	White	Black	Male	Female	Married	Single	Total	Per cent.
Apparently cured,	148	2	71	79	40	110	150	2.62
Arrested,	1212	30	654	588	451	791	1242	21.68
Improved,	2366	61	1532	895	1252	1175	2427	42.37
Progressive,	1426	47	910	563	705	768	1473	25.71
Died,	400	36	315	121	177	259	436	7.61
Total,	5552	176	3482	2246	2625	3103	5728	....

REPORT ON RESULTS OBTAINED FROM THE USE OF THE BIOLOGICAL PRODUCTS OF THE TUBERCLE BACILLUS (SUSPENSION OF DEAD TUBERCLE BACCILLI AND EXTRACT OF TUBERCLE BACILLUS, DIXON) AT THE PENNSYLVANIA STATE SOUTH MOUNTAIN SANATORIUM FOR TUBERCULOSIS, AT MONT ALTO, DURING THE YEAR 1911.

By DR. FRED C. JOHNSON and DR. JOHN BERRY.

This Report comprises a study of the results obtained in three hundred and thirteen (313) cases of pulmonary tuberculosis treated with the Biological Products of the Tubercle Bacillus at the Mont Alto State Sanatorium.

The products of the Tubercle Bacillus used were prepared by the State Laboratories in the form of the Tubercle Bacilli Extract (Dixon) and Suspension of Dead Tubercle Bacilli (Dixon) and furnished in syringes with accompanying sterile needle ready for injection in the following series of dilutions:

TUBERCLE BACILLI EXTRACT.

Dilution No. 1, containing the extract from one milligram (0.001 gram) of tubercle bacilli.

Dilution No. 2, containing the extract from ten milligrams (0.01 gram) of tubercle bacilli.

Dilution No. 3, containing the extract from twenty milligrams (0.02 gram) of tubercle bacilli.

Dilution No. 4, containing the extract from thirty milligrams (0.03 gram) of tubercle bacilli.

Dilution No. 5, containing the extract from forty milligrams (0.04 gram) of tubercle bacilli.

Dilution No. 6, containing the extract from fifty milligrams (0.05 gram) of tubercle bacilli.

Dilution No. 7, containing the extract from sixty milligrams (0.06 gram) of tubercle bacilli.

Dilution No. 8, containing the extract from seventy milligrams (0.07 gram) of tubercle bacilli.

Dilution No. 9, containing the extract from eighty milligrams (0.08 gram) of tubercle bacilli.

Dilution No. 10, containing the extract from ninety milligrams (0.09 gram) of tubercle bacilli.

Dilution No. 11, containing the extract from one hundred milligrams (0.10 gram) of tubercle bacilli.

Dilution No. 12, containing the extract from one hundred ten milligrams (0.11 gram) of tubercle bacilli.

Dilution No. 13, containing the extract from one hundred twenty milligrams (0.12 gram) of tubercle bacilli.

Dilution No. 14, containing the extract from one hundred thirty milligrams (0.13 gram) of tubercle bacilli.

Dilution No. 15, containing the extract from one hundred forty milligrams (0.14 gram) of tubercle bacilli.

Dilution No. 16, containing the extract from one hundred fifty milligrams (0.15 gram) of tubercle bacilli.

Dilution No. 17, containing the extract from one hundred sixty milligrams (0.16 gram) of tubercle bacilli.

Dilution No. 18, containing the extract from one hundred seventy milligrams (0.17 gram) of tubercle bacilli.

Dilution No. 19, containing the extract from one hundred eighty milligrams (0.18 gram) of tubercle bacilli.

Dilution No. 20, containing the extract from one hundred ninety milligrams (0.19 gram) of tubercle bacilli.

SUSPENSION OF DEAD TUBERCLE BACILLI.

Dilution No. 1, containing one one-thousandth of a milligram (0.000,001 gram) of dead tubercle bacilli.

Dilution No. 2, containing one one-hundredth of a milligram (0.000,01 gram) of dead tubercle bacilli.

Dilution No. 3, containing two one-hundredths of a milligram (0.000,02 gram) of dead tubercle bacilli.

Dilution No. 4, containing three one-hundredths of a milligram (0.000,03 gram) of dead tubercle bacilli.

Dilution No. 5, containing four one-hundredths of a milligram (0.000,04 gram) of dead tubercle bacilli.

Dilution No. 6, containing five one-hundredths of a milligram (0.000,05 gram) of dead tubercle bacilli.

Dilution No. 7, containing six one-hundredths of a milligram (0.000,06 gram) of dead tubercle bacilli.

Dilution No. 8, containing seven one-hundredths of a milligram (0.000,07 gram) of dead tubercle bacilli.

Dilution No. 9, containing eight one-hundreths of a milligram (0.000,08 gram) of dead tubercle bacilli.

Dilution No. 10, containing nine one-hundredths of a milligram (0.000,09 gram) of dead tubercle bacilli.

Dilution No. 11, containing ten one-hundreths of a milligram (0.000,10 gram) of dead tubercle bacilli.

Dilution No. 12, containing eleven one-hundreths of a milligram (0.000,11 gram) of dead tubercle bacilli.

Dilution No. 13, containing twelve one-hundredths of a milligram (0.000,12 gram) of dead tubercle bacilli.

Dilution No. 14, containing thirteen one-hundredths of a milligram (0.000,13 gram) of dead tubercle bacilli.

Dilution No. 15, containing fourteen one-hundredths of a milligram (0.000,14 gram) of dead tubercle bacilli.

Dilution No. 16, containing fifteen one-hundredths of a milligram (0.000,15 gram) of dead tubercle bacilli.

The treatment is begun with the injection of Dilution No. 1 and repeated at intervals of one week for three or four weeks, depending upon the resistance of the patient to the toxin. If the patient does not show a marked susceptibility the treatment is continued with a very gradual increase of the dose number by number.

Clinically the Suspension of Dead Tubercle Bacilli has been found to be much more toxic in its effects than the Tubercle Bacilli Extract and was accordingly used only in those cases showing very high resistance, and in whom practically all the symptoms of tubercular toxaemia were absent.

In instances where both products have been used, the first employed as a rule was the Suspension of Dead Tubercle Bacilli, which was replaced by the Tubercle Bacilli Extract in those cases showing a tendency to reaction. Occasionally, however, cases in which the

Extract was used were found to be more tolerant to the toxin than anticipated when the treatment was instituted and were later given the Suspension.

These Products were administered weekly as indicated and for a period of forty-eight (48) hours subsequent to administration, temperature, pulse and respirations were taken and recorded at intervals of three hours during which time observations were also made as to the presence of symptoms suggestive of reaction other than thermic.

Injections have been made well under the skin to facilitate absorption, the site usually selected being just below and internal to the angle of the scapula. After the injection the puncture is covered with sterile cotton and sealed with collodion. Thus far no case of infection has followed the administration of the products. Occasionally, however, areas of induration have occurred at the site of the injection, accompanied by signs of inflammation, which in all probability were due to delayed absorption of the product. Other than these, the occurrence of local reactions has been practically nil.

General reactions have occurred, although infrequently. In cases in which symptoms suggestive of general reaction have developed, the dose has been diminished or the product discontinued, pending the disappearance of such symptoms. In the event of pronounced general reaction, the administration of the product has been temporarily discontinued for a period of weeks or the dose decreased and with the occurrence of a general reaction following its resumption, discontinued permanently.

The cases selected for this treatment were as a rule those in which the symptoms of persistent toxaemia, such as elevation of temperature, tachycardia, constant fatigue, rapid loss of weight, etc., were absent.

It is perhaps noteworthy that a number of cases classified as Far Advanced have received the treatment with gratifying results.

Prior to the institution of the treatment, the patients were kept under observation for a period of not less than two weeks and in instances, longer, depending upon the persistence of symptoms contraindicating its use.

By reference to Table No. 1 which shows the results grouped according to the period patients remained under treatment, it will be noted, that the percentage of cases in which the disease became controlled (either arrested or apparently cured) increased progressively with longer periods of treatment.

For example, among the Incipient cases that remained under treatment less than three months, the disease became arrested in 21.87 per cent.; either arrested or apparently cured in 74.54 per cent. of

STATISTICAL REPORT OF THE RESULTS OF TREATMENT IN THREE HUNDRED AND THIRTEEN (313) CASES OF PULMONARY TUBERCULOSIS TREATED WITH THE BIOLOGICAL PRODUCTS OF THE TUBERCLE BACILLUS AT THE MONT ALTO STATE SANATORIUM DURING THE YEAR ENDING DECEMBER 31st, 1911.

TABLE NO. 1.

INCIPIENT.

Period of Treatment.	Sex.			Apparently Cured.		Arrested.		Improved.		Progressive.		Gain in weight.			Loss in weight.			
	Male.	Female.	Total.	No.	P. C.	No.	P. C.	No.	P. C.	No.	P. C.	No.	P. C.	Average gain.	No.	P. C.	Average loss.	Average Hosp. Days.
Under three months,	20	12	32	0	0	7	21.87	25	78.12	0	0	30	93.75	8.24	2	6.25	1.37	48.75
Three to six months,	34	21	55	14	25.45	27	49.09	13	23.63	1	1.81	54	98.18	11.46	1	1.81	1.50	115.74
Six months or over,	5	8	13	6	46.15	6	46.15	1	7.69	0	0	12	92.30	15.35	1	7.69	7.25	[illegible]
Total,	59	41	100	20	20	40	40	39	39	1	1	96	96	10.73	4	4	2.87	110.90

MODERATELY ADVANCED.

Period of Treatment.	Male.	Female.	Total.	No.	P. C.	No.	P. C.	No.	P. C.	No.	P. C.	No.	P. C.	Average gain.	No.	P. C.	Average loss.	Average Hosp. Days.
Under three months,	25	16	41	0	0	11	26.83	24	58.53	6	14.63	35	85.36	9.62	6	14.63	4.20	52.85
Three to six months,	49	40	89	17	19.10	*45	50.56	24	26.96	3	3.37	81	91.01	12.05	8	8.98	4.31	113.24
Six months and over,	11	27	38	10	26.31	19	50%	7	18.42	2	5.26	34	89.47	11.12	4	10.52	7.50	296.44
Total,	85	83	168	27	16.07	75	44.61	55	32.73	11	6.54	150	89.28	11.21	18	10.71	5.62	139.93

FAR ADVANCED.

Period of Treatment.	Male.	Female.	Total.	No.	P. C.	No.	P. C.	No.	P. C.	No.	P. C.	No.	P. C.	Average gain.	No.	P. C.	Average loss.	Average Hosp. Days.
Under three months,	5	2	7	0	0	1	14.28	6	85.71	0	0	6	85.71	9.79	1	14.28	1	63.28
Three to six months,	8	11	19	0	0	12	64.21	6	31.57	1	5.26	19	[illegible]	10.75	0	0	0	134.84
Six months or over,	11	8	19	0	0	12	64.21	3	15.78	*4	21.05	12	63.15	15.25	7	36.84	7.57	394.78
Total,	24	21	45	0	0	25	55.55	15	33.33	5	11.11	37	82.22	12.06	8	17.77	6.62	203.48

*One death.

those who remained from three to six months; and these results were obtained in 92.30 per cent. of those remaining over six months.

By further reference to Table No. 1, it will be noted that of the one hundred (100) Incipient cases treated, twenty (20) or 20 per cent. were discharged as Apparently Cured, forty (40) or 40 per cent. as Disease Arrested, and thirty-nine (39) or 39 per cent. as Improved, while in one or 1 per cent. the disease remained Progressive.

Of the one hundred and sixty-eight (168) Moderately Advanced cases, twenty-seven (27) or 16.07 per cent. were Apparently Cured, seventy-five (75) or 44.44 per cent. Arrested, fifty-five (55) or 32.73 per cent. Improved, while the disease remained Progressive in eleven (11) or 6.54 per cent.

Among the Arrested cases of this group is included one (1) death, which occurred in a case in whom the tuberculous process was thoroughly arrested and was apparently due to an idiopathic oedema of the larynx. Permission for autopsy could not be obtained. This patient was under treatment for four (4) months and eight (8) days and during this period his cough disappeared, his temperature remained approximately normal, he gained seventeen and one half ($17\frac{1}{2}$) pounds in weight and physical examination revealed marked and progressive improvement in the pulmonary lesion.

Of the forty-five (45) Far Advanced cases, the disease became Arrested in twenty-five (25) or 55.55 per cent., Improved in fifteen (15) or 33.33 per cent. and remained Progressive in five (5) or 11.11 per cent. Among the patients discharged as Progressive in this group, one death has been included. This patient had been under treatment for one (1) year, nine (9) months and twenty-four (24) days. The pulmonary lesions were complicated by frank and intense symptoms of tuberculous enteritis, which was the contributing cause of death. The Biological Products of the Tubercle Bacillus had not been administered in this case for thirteen (13) months prior to death on account of the great activity of the process.

The following cases, one of each classification, are cited as showing rather exceptional improvement while under treatment:

W. K.—Admitted August 27, 1910, male, age 21, white, occupation: Painter.

FAMILY HISTORY: Father and sister died of pulmonary tuberculosis.

PREVIOUS HEALTH: Good with the exception of pertussis in 1900 and influenza in 1905, from both of which he made a satisfactory recovery.

PRESENT ILLNESS: Had pulmonary hemorrhage July 31, 1910. Developed night sweats and elevation of temperature one week later and during the month preceding his admission to the Sanatorium, lost fifteen pounds in weight. Cough was absent on admission and the amount of expectoration was small but positive for tubercle bacilli. For two weeks following admission this patient's temperature, pulse and respirations varied from 96.3-99°, 72-90 and 20-24 respectively.

CHEST EXAMINATION: Heart, apparently normal.

Lungs: Tuberculous involvement of the apex of the upper lobe of the right lung evidenced by relative dullness, rough vesiculo-bronchial breathing and the presence of crepitant râles.

ADMISSION CLASSIFICATION: Incipient.

Treatment was instituted two weeks following admission in the form of Tubercle Bacilli Extract and continued to the time of his discharge. He receved twenty-two (22) injections, the last aud largest dose being Dilution No. 6.

RESULTS OF TREATMENT: Patient remained under treatment for six months and during this time tubercle bacilli disappeared from his sputum, he gained sixteen pounds in weight and examination of the chest at the time of discharge failed to reveal any sign of pulmonary disturbance.

DISCHARGE CLASSIFICATION: Apparently cured.

PRESENT CONDITION: A report of the condition of this patient received from the physician in charge of his home Dispensary sixteen (16) months subsequent to discharge stated that his health was normal, that he had resumed his former occupation and was working nine hours per day.

K. M.—Admitted August 12, 1910, female, age 24, white, occupation: seamstress.

FAMILY HISTORY: Negative as regards tuberculosis.

PREVIOUS HEALTH: Pneumonia at 17, good recovery. Pleurisy on left side six months prior to admission.

PRESENT ILLNESS: Patient dates present illness from the attack of pleurisy which was followed by hoarseness, elevation of temperature, loss of weight and cough, which at first was non-productive, but later became productive, the amount of expectoration increasing slowly to the time of admission when it was profuse, of a purulent character and positive for tubercle bacilli.

For two weeks following admission this patient's temperature, pulse and respirations varied from 97.4-100°, 80-112 and 24-30 respectively.

CHEST EXAMINATION: Heart, apparently normal.

Lungs: Tuberculous involvement of the upper lobes of both lungs with marked signs of activity throughout the diseased areas, as evidenced by the presence of sub-crepitant râles.

ADMISSION CLASSIFICATION: Moderately advanced

The administration of the Tubercle Bacilli Extract was instituted three weeks subsequent to admission and continued to the date of discharge. She received sixteen injections, the last and largest dose being Dilution No. 5.

RESULTS OF TREATMENT: Patient remained under treatment for six (6) months and eleven (11) days; her cough, expectoration and hoarseness entirely disappeared as did also the tubercle bacilli from the sputum. She gained 16 3 4 pounds in weight and felt correspondingly stronger.

A study of the chest charts reveals an improvement in the physical signs corresponding to that already noted in the subjective symptoms. The last examination, made two weeks prior to discharge, shows marked improvement of the reasonance over the diseased areas, while only a few fine crepitations probably pleural in origin, were heard over the apices.

DISCHARGE CLASSIFICATION: Disease arrested.

PRESENT CONDITION: Fourteen months subsequent to discharge a report of the patient's condition was received from the physician in charge of her home Dispensary, in which he stated that the disease had remained arrested, that cough and expectoration had not returned and that she had resumed her former occupation and was working nine hours per day without feeling unduly fatigued.

H. E. B.—Admitted August 18, 1910, male, age 24, white, occupation: street car conductor.

FAMILY HISTORY:Negative as regards tuberculosis.

PREVIOUS HEALTH: Pneumonia, 1907, frequent colds since that time and haemoptysis six (6) months prior to admission.

PRESENT ILLNESS: Patient's health has not been normal since the attack of pneumonia. He had fever and night sweats at intervals since December 1909, with a slow, but progressive loss in weight. Cough and expectoration have been present for the last six months. Sputum on admission was purulent, and positive for tubercle bacilli. His temperature, pulse and respirations for three weeks following admission varied from 96-99.2, 86-110 and 20-24 respectively.

CHEST EXAMINATION: Heart, apparently normal.

Lungs: Tuberculous involvement of the two upper lobes of the right lung, the upper lobe of the left, with unmistakable signs of cavity formation in the left apex anteriorly, extending down to the third rib; sub-crepitant râles throughout the involved areas.

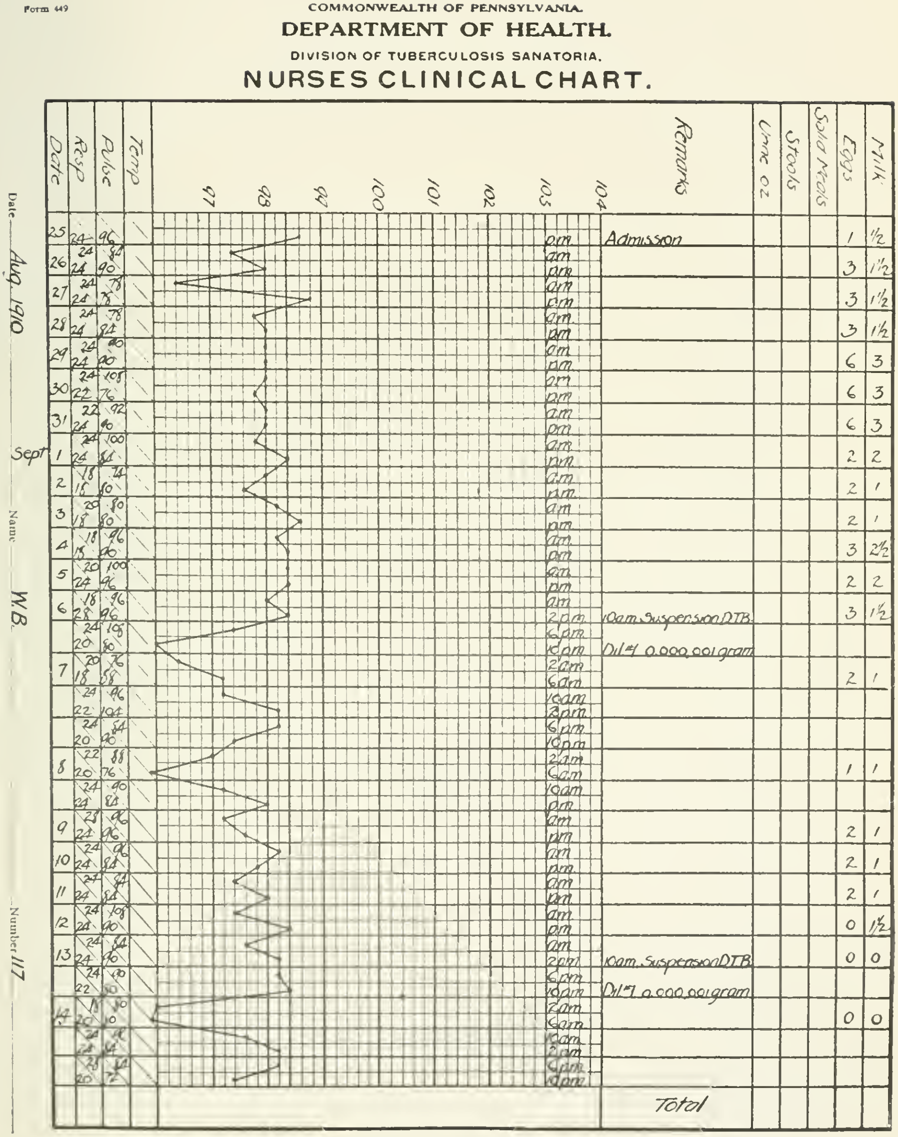
ADMISSION CLASSIFICATION: Far advanced.

The administration of the Biological Products of the Tubercle Bacillus were not instituted in this case for one month subsequent to admission on account of a rather widely fluctuating temperature. He received twenty (20) injections of the Tubercle Bacilli Extract, the last and largest dose being Dilution No. 6.

RESULTS OF TREATMENT: The patient remained under treatment for seven months and one week; his cough and expectoration diminshed in severity and amount, there was a gain of fourteen pounds in weight, while examination of the chest at the time of discharge showed marked improvement in his pulmonary lesions, only a few crepitations being heard at the righ apex, together with pleural friction over the area of cavity formation.

DISCHARGE CLASSIFICATION: Disease arrested.

PRESENT CONDITION: The report received from the physician in charge of the patient's home Dispensary twenty-one months subsequent to discharge stated that his condition had continued to improve and that he was physically able to work.



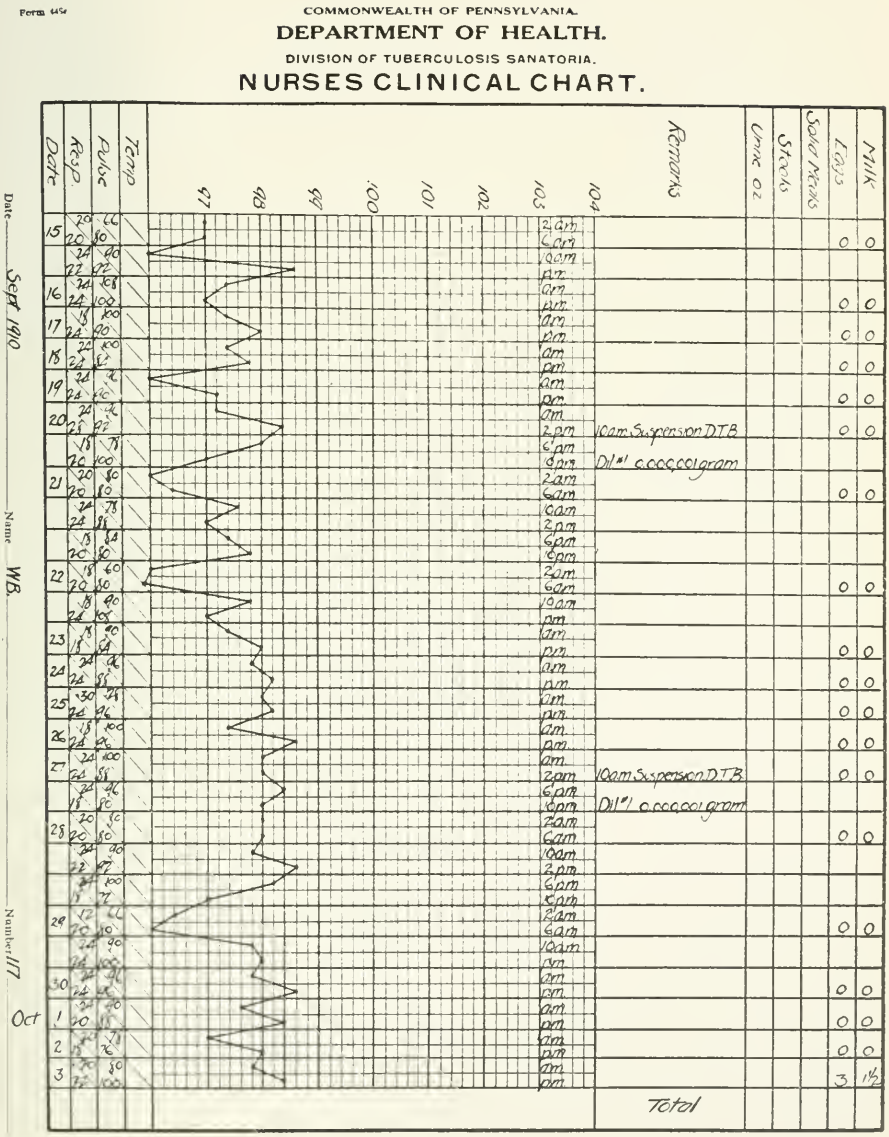
Form 449

COMMONWEALTH OF PENNSYLVANIA.
DEPARTMENT OF HEALTH.
DIVISION OF TUBERCULOSIS SANATORIA.
NURSES CLINICAL CHART.

Date Aug. 1910
Name W.B.
Number 117

Date	Resp	Pulse	Temp		Remarks	Urine oz	Stools	Solid Meals	Eggs	Milk
25	24	96		pm	Admisson				1	½
26	24 24	84 90		am pm					3	1½
27	24 24	78 78		am pm					3	1½
28	24 24	78 84		am pm					3	1½
29	24 24	80 80		am pm					6	3
30	24 22	108 76		am pm					6	3
31	22 24	92 90		am pm					6	3
Sept 1	24 24	100 84		am pm					2	2
2	18 16	74 80		am pm					2	1
3	20 18	80 80		am pm					2	1
4	18 18	96 90		am pm					3	2½
5	20 24	100 96		am pm					2	2
6	18 28	96 96		am 2pm	10am Suspension DTB				3	1½
	24 20	108 80		6pm 10pm	Dil #1 0.000,001 gram					
7	20 18	76 58		2am 6am					2	1
	24 22	96 104		10am 2pm						
	24 20	84 90		6pm 10pm						
8	22 20	88 76		2am 6am					1	1
	24 24	90 84		10am pm						
9	23 24	96 96		am pm					2	1
10	24 24	96 84		am pm					2	1
11	24 24	84 84		am pm					2	1
12	24 24	108 90		am pm					0	1½
13	24 24	84 90		am 2pm	10am. Suspension DTB				0	0
	24 22	90 80		6pm 10pm	Dil #1 0.000,001 gram					
14	18 20	80 [illegible]		2am 6am					0	0
	24 24	96 84		10am 2pm						
	28 20	84 72		6pm 10pm						
					Total					

Chart I.
Chart of Temperature During Treatment with the Suspension of Dead Tubercle Bacilli.



Form 454

COMMONWEALTH OF PENNSYLVANIA.

DEPARTMENT OF HEALTH.

DIVISION OF TUBERCULOSIS SANATORIA.

NURSES CLINICAL CHART.

Date Sept 1910

Name W.B.

Number 117

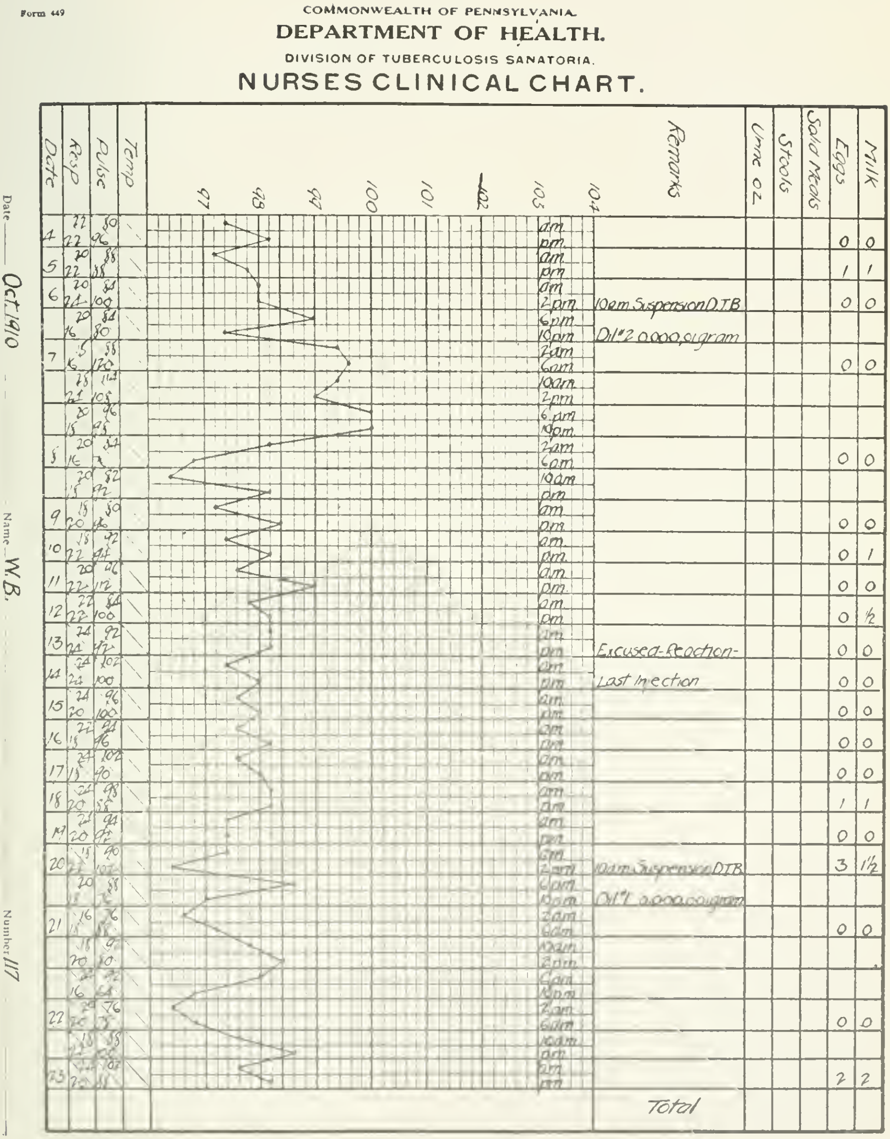
10am Suspension D.T.B Dil #1 0.000,001 gram

10am Suspension D.T.B. Dil #1 0.000,001 gram

Total

Chart II.

Chart of Temperature During Treatment with the Suspension of Dead Tubercle Bacilli.



Form 449

COMMONWEALTH OF PENNSYLVANIA.
DEPARTMENT OF HEALTH.
DIVISION OF TUBERCULOSIS SANATORIA.
NURSES CLINICAL CHART.

Date Oct. 1910
Name W.B.
Number 117

Date	Resp	Pulse		Remarks	Urine oz.	Stools	Solid Meals	Eggs	Milk
4	22	80	am					0	0
	22	96	pm						
5	20	88	am					1	1
	22	88	pm						
6	20	84	am					0	0
	24	100	2pm	10am Suspension D.T.B.					
	20	84	6pm						
	16	80	10pm	Dil#2 0.000,01 gram					
7	15	88	2am					0	0
	16	120	6am						
	28	112	10am						
	24	105	2pm						
	20	96	6pm						
	15	95	10pm						
8	20	84	2am					0	0
	16	[illegible]	6am						
	20	82	10am						
	15	92	pm						
9	18	80	am					0	0
	20	[illegible]	pm						
10	18	92	am					0	1
	22	94	pm						
11	20	96	am					0	0
	22	112	pm						
12	22	84	am					0	½
	22	100	pm						
13	24	92	am					0	0
	24	92	pm	Excused - Reaction -					
14	24	102	am					0	0
	24	100	pm	Last Injection					
15	24	96	am					0	0
	20	100	pm						
16	22	84	am					0	0
	18	96	pm						
17	24	102	am					0	0
	18	90	pm						
18	24	98	am					1	1
	20	88	pm						
19	24	94	am					0	0
	20	92	pm						
20	18	90	am					3	1½
	[illegible]	[illegible]	2am	10am Suspension D.T.B.					
	20	88	6am						
	[illegible]	[illegible]	10am	Dil#1 0.000,01 gram					
21	16	76	2am					0	0
	18	88	6am						
	18	96	10am						
	20	80	2pm						
	[illegible]	92	6am						
	16	64	10pm						
22	20	76	2am					0	0
	20	[illegible]	6am						
	18	88	10am						
	[illegible]	[illegible]	pm						
23	[illegible]	[illegible]	am					2	2
	[illegible]	[illegible]	pm						
				Total					

Chart III.
Chart of Temperature During Treatment with the Suspension of Dead Tubercle Bacilli.

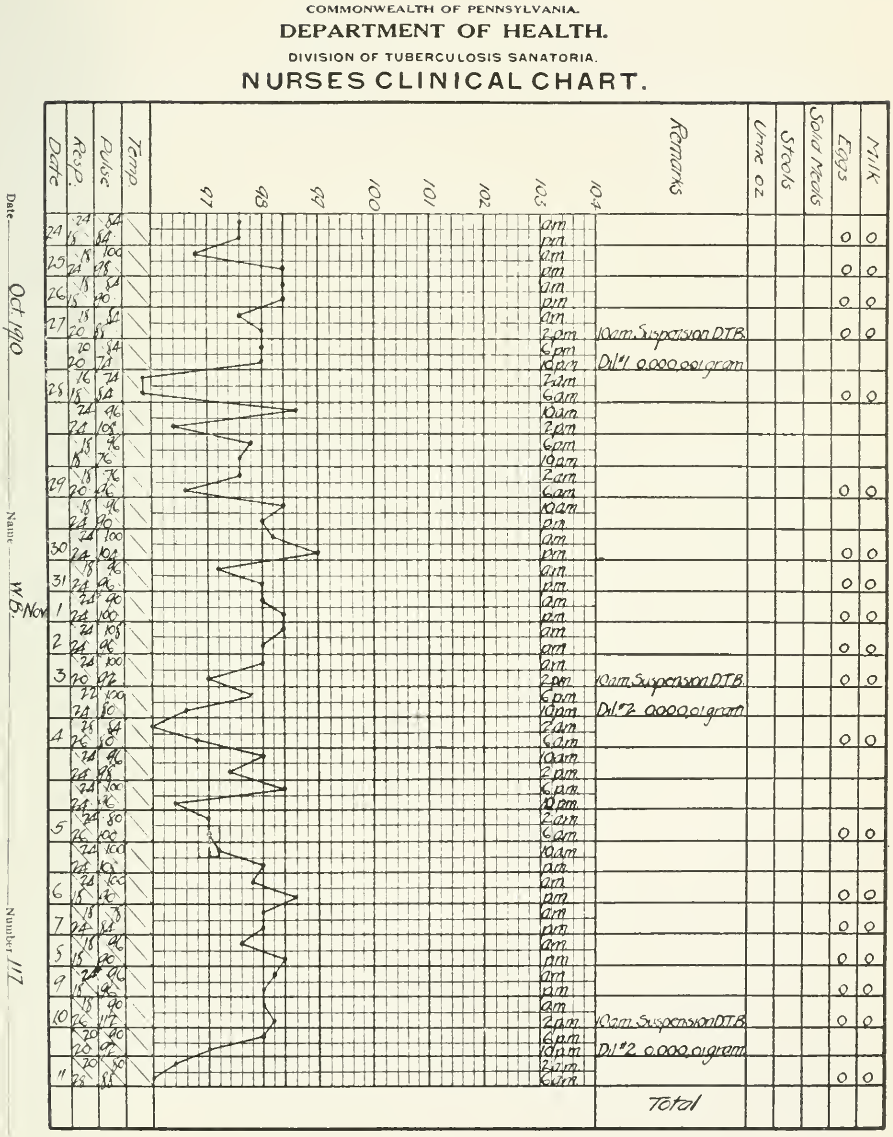


Chart IV.
Chart of Temperature During Treatment with the Suspension of Dead Tubercle Bacilli.

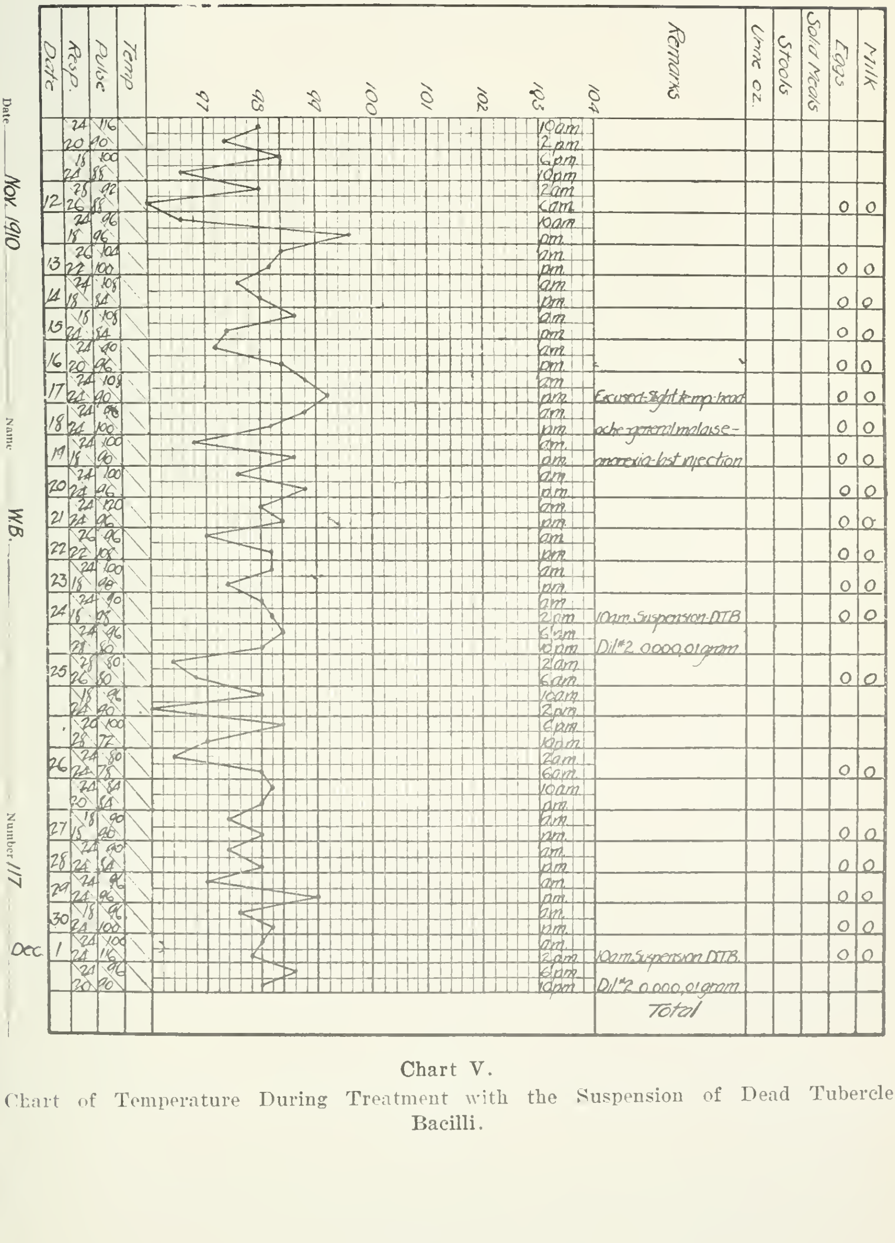
Form 449

COMMONWEALTH OF PENNSYLVANIA.

DEPARTMENT OF HEALTH.

DIVISION OF TUBERCULOSIS SANATORIA.

NURSES CLINICAL CHART.



Date Nov. 1910

Name W.B.

Number 117

Excused-Slight temp-headache-general malaise-anorexia-lost injection

10am Suspension-DTB Dil#2 0.000,01 gram

10am Suspension DTB. Dil#2 0.000,01 gram

Chart V.

Chart of Temperature During Treatment with the Suspension of Dead Tubercle Bacilli.

Form 449

COMMONWEALTH OF PENNSYLVANIA.

DEPARTMENT OF HEALTH.

DIVISION OF TUBERCULOSIS SANATORIA.

NURSES CLINICAL CHART.

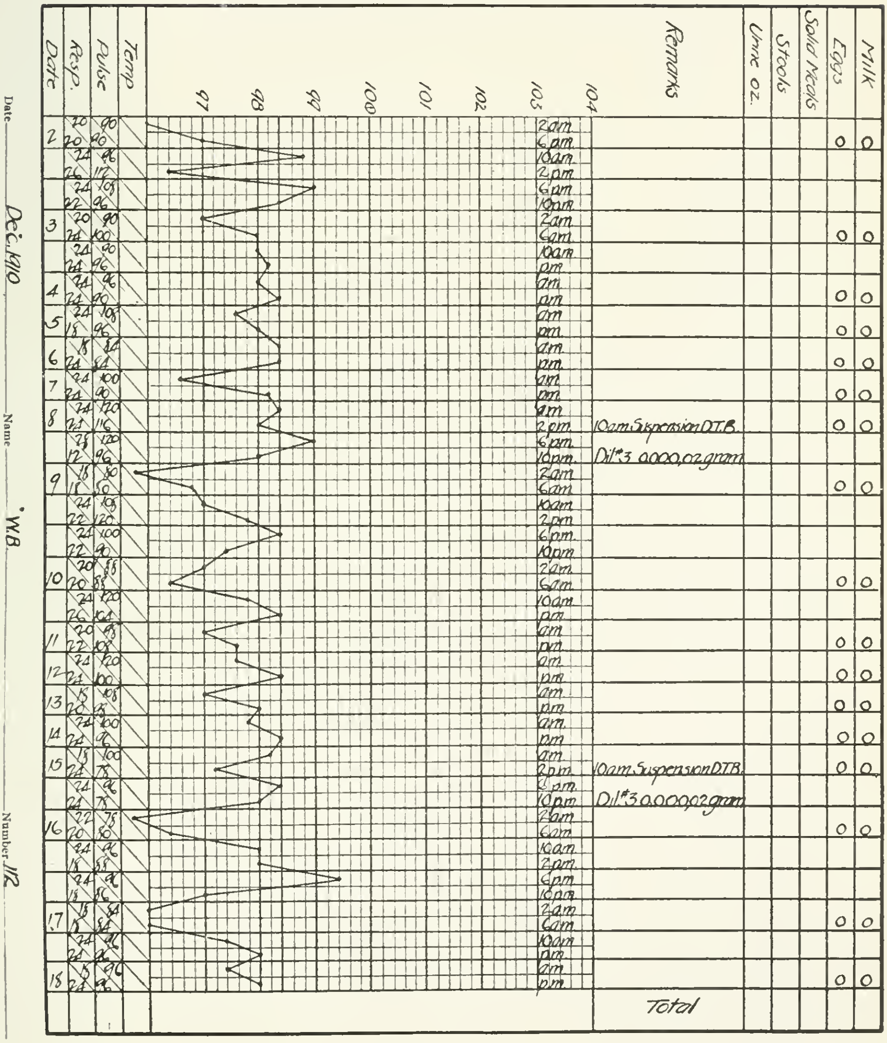
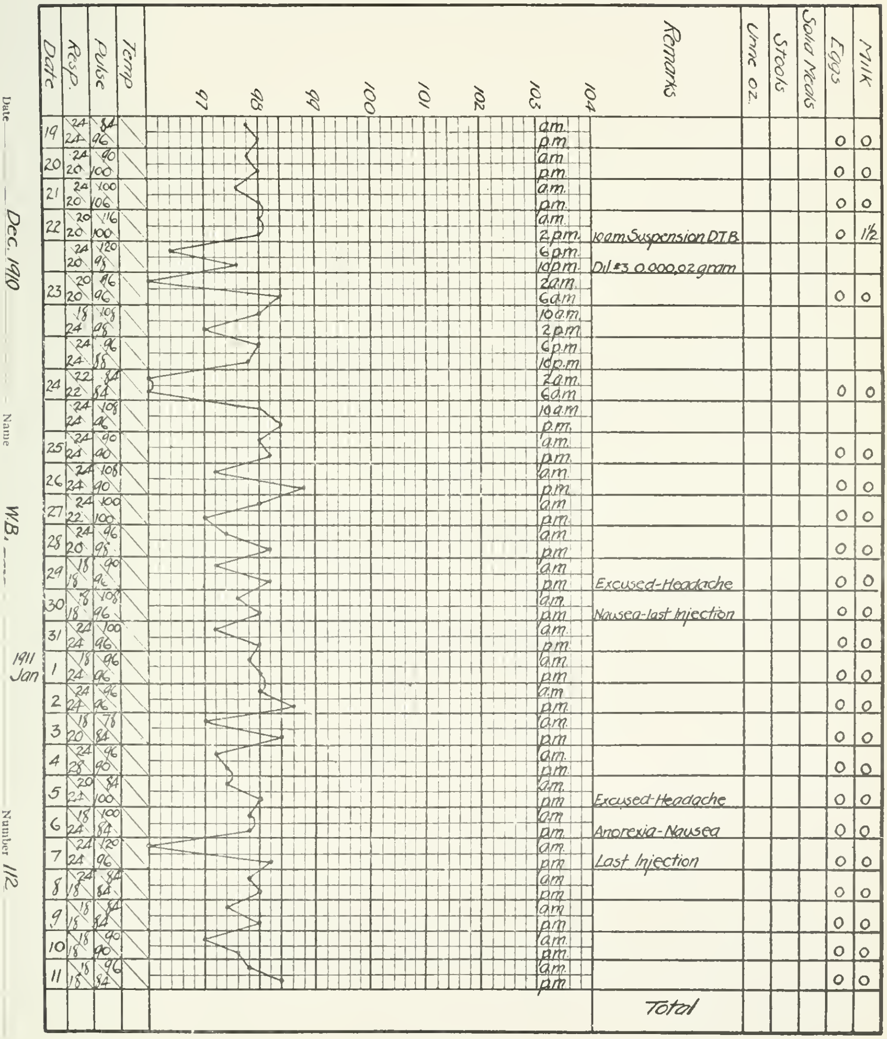


Chart VI.

Chart of Temperature During Treatment with the Suspension of Dead Tubercle Bacilli.

Form 449

COMMONWEALTH OF PENNSYLVANIA.
DEPARTMENT OF HEALTH.
DIVISION OF TUBERCULOSIS SANATORIA.
NURSES CLINICAL CHART.



Date Dec. 1910
Name W.B.
Number 112

Date	Resp.	Pulse	Temp		Remarks	Urine oz.	Stools	Solid Meals	Eggs	Milk
19	24 24	84 96		a.m. p.m.					0	0
20	24 20	90 100		a.m p.m.					0	0
21	24 20	100 106		a.m. p.m.					0	0
22	20 20	116 100		a.m. 2 p.m.	10 a.m. Suspension D.T.B.				0	1½
	24 20	120 98		6 p.m. 10 p.m.	Dil #3 0.000,02 gram					
23	20 20	96 96		2 a.m. 6 a.m					0	0
	18 24	108 98		10 a.m. 2 p.m						
	24 24	96 88		6 p.m 10 p.m						
24	22 22	84 84		2 a.m. 6 a.m					0	0
	24 24	108 96		10 a.m p.m.						
25	24 24	90 90		a.m. p.m.					0	0
26	24 24	108 90		a.m. p.m.					0	0
27	24 22	100 100		a.m p.m.					0	0
28	24 20	96 98		a.m. p.m					0	0
29	18 18	90 96		a.m p.m	Excused-Headache				0	0
30	18 18	108 96		a.m. p.m	Nausea-last Injection				0	0
31	24 24	100 96		a.m. p.m.					0	0
1911 Jan 1	18 24	96 96		a.m. p.m					0	0
2	24 24	96 96		a.m p.m.					0	0
3	18 20	78 84		a.m. p.m					0	0
4	24 28	96 90		a.m. p.m.					0	0
5	20 24	84 100		a.m. p.m	Excused-Headache				0	0
6	18 24	100 84		a.m p.m.	Anorexia-Nausea				0	0
7	24 24	120 96		a.m. p.m	Last Injection				0	0
8	24 18	84 84		a.m p.m					0	0
9	18 18	84 84		a.m p.m					0	0
10	18 18	90 90		a.m. p.m.					0	0
11	18 18	96 84		a.m. p.m					0	0
					Total					

Chart VII.

Chart of Temperature During Treatment with the Suspension of Dead Tubercle Bacilli.

Form 449

COMMONWEALTH OF PENNSYLVANIA.

DEPARTMENT OF HEALTH.

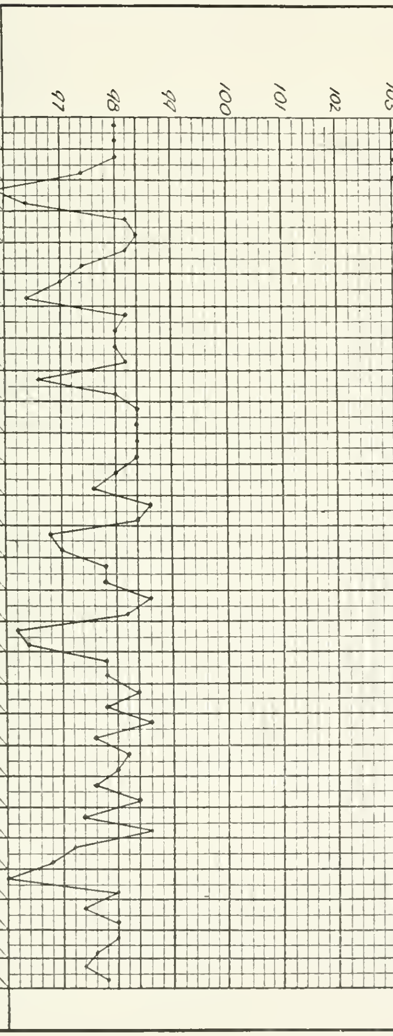
DIVISION OF TUBERCULOSIS SANATORIA.

NURSES CLINICAL CHART.

Date Jan 1911

Name W.B.

Number 112



Date	Resp.	Pulse	Temp.		Remarks	Urine oz	Stools	Solid foods	Eggs	Milk
12	24 18	100 78		am 2pm	10am. Suspension D.T.B.				0	0
	18 20	90 80		6pm 10pm	Dil #3 0.000.02 gram					
13	18 18	78 72		2am 6am					0	0
	18 22	108 84		10am 2pm						
	18 20	90 72		6pm 10pm						
14	18 18	72 64		2am 6am					0	0
	18 18	108 96		10am pm						
15	20 20	100 110		am pm					0	0
16	24 24	100 96		am pm					0	0
17	24 24	108 96		am pm					0	0
18	24 24	100 90		am pm					0	0
19	24 18	100 90		am 2pm	10am. Suspension D.T.B.				0	0
	18 20	96 98		6pm 10pm	Dil #4 0.000.03 gram					
20	20 20	84 70		2am 6am					0	0
	18 22	100 92		10am 2pm						
	18 20	92 100		6pm 10pm						
21	20 20	92 88		2am 6am					0	0
	18 22	100 110		10am pm						
22	24 24	96 78		am pm					0	0
23	18 24	96 96		am pm					0	0
24	24 20	108 92		am pm					0	0
25	18 24	100 90		am pm					0	0
26	18 24	96 90		am 2pm	10am. Suspension D.T.B.				0	0
	24 18	90 72		6pm 10pm	Dil #4 0.000.03 gram					
27	18 18	78 78		2am 6am					0	0
	18 24	100 90		10am 2pm						
	24 20	84 98		6pm 10pm						
28	18 18	90 88		2am 6am					0	0
					Total					

Chart VIII.

Chart of Temperature During Treatment with the Suspension of Dead Tubercle Bacilli.

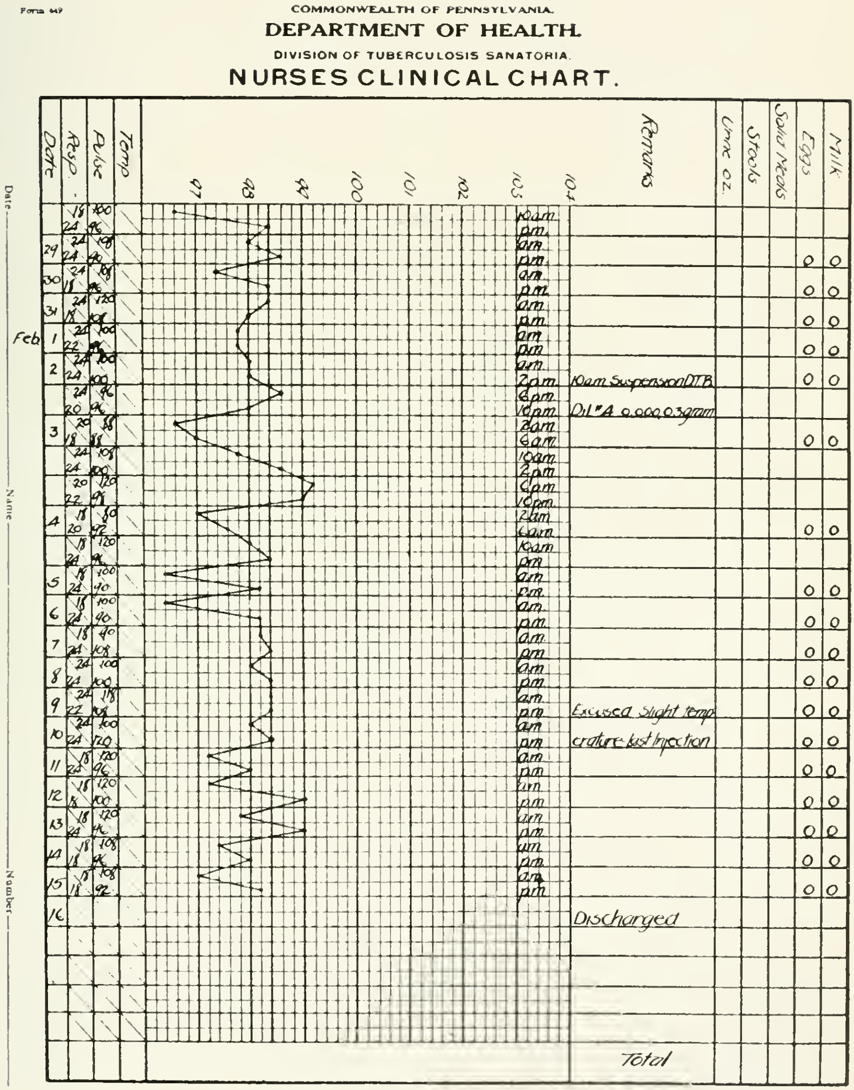


Chart IX.

Chart of Temperature During Treatment with the Suspension of Dead Tubercle Bacilli.

The following clinical chart is that of a Moderately Advanced case who at the time of admission had involvement of the upper lobes of both lungs, signs of activity over the left upper lobe and a complicating bi-lateral tuberculous arthritis of the ankle joints. It will be noted that temperature records were made at three (3) hour intervals for a period of forty-eight (48) hours after an injection and recorded in red ink.

This patient received four injections of the Suspension of Dead Tubercle Bacilli, Dilution No. 1, during the first month, without any manifestation of intolerance, but following the first injection of Dilution No. 2 on November 3 ,1910, a general reaction occurred, the subjective symptoms being general malaise, anorexia, headache and backache. Following this reaction, injections were not resumed for two weeks, at which time the dose was reduced to Dilution No. 1. During the subsequent course of treatment, less severe subjective symptoms without marked febrile phenomena occurred, following which the treatment was temporarily discontinued. The patient remained under treatment for a period of five months and twenty-one days, and at the time of discharge signs of pulmonary activity had entirely disappeared. There had been a gain of twenty and one-fourth (20¼) pounds in weight, with closure of an old sinus of the ankle joint.

Report received from the home Dispensary of this patient nineteen months subsequent to discharge stated that his general condition had continued to improve, that there had been no recurrence of symptoms of activity and while he had changed his occupation from barber to that of janitor he was working eight (8) hours daily, with an increase in earning capacity of $10.00 per month ($60.00 to $70.00).

A study of the tables showing the influence of the treatment on many of the cardinal symptoms of the disease evidence a uniform and progressive improvement, varying with the length of treatment.

TABLE NO. 2.—A STATISTICAL REPORT ON THE INCIPIENT CASES.
SHOWING THE INFLUENCE OF TREATMENT UPON THE MORE INPORTANT SYMPTOMS.†

Symptoms.	Period of treatment.	Absent on admission.	Per cent.	Developed.	Per cent.	Present on admission.	Per cent.	Disappeared.	Per cent.	Improved.	Per cent.	Unchanged.	Per cent.	Progressive.	Per cent.
Cough,	Under three months,	11	34.27	0	0	21	65.72	8	38.09	8	38.09	5	23.80	0	0
	Three to six months,	16	29.62	0	0	38	70.37	22	57.89	10	26.31	4	10.52	2	5.26
	Over six months,	5	38.46	0	0	8	61.53	6	75.00	2	25.00	0	0	0	0
Expectoration,	Under three months,	7	21.87	1	12.28	25	78.12	6	24.00	10	40.00	9	36.00	0	0
	Three to six months,	13	24.07	0	0	41	75.92	15	36.58	15	36.58	7	17.07	4	9.75
	Over six months,	3	23.07	0	0	10	76.92	7	70.00	2	20.00	1	10.00	0	0
Hoarseness,	Under three months,	26	81.25	1	3.84	6	18.75	5	83.33	1	16.66	0	0	0	0
	Three to six months,	27	50.00	2	7.40	27	50.00	24	88.88	2	7.40	1	3.70	0	0
	Over six months,	9	69.23	0	0	4	30.76	4	100	0	0	0	0	0	0
Haemoptysis,	Under three months,	26	81.25	1	3.84	°6	18.75	5	83.33	1	16.66	0	0	0	0
	Three to six months,	38	70.37	0	0	16	29.62	15	93.75	1	6.25	0	0	0	0
	Over six months,	11	84.61	0	0	2	15.38	2	100	0	0	0	0	0	0
Pleurisy,*	Under three months,	19	59.37	0	0	13	40.62	7	53.84	1	7.69	5	38.46	0	0
	Three to six months,	24	44.44	1	4.16	30	55.55	23	76.66	3	10.00	4	13.33	0	0
	Over six months,	7	53.84	0	0	6	46.15	5	83.33	1	16.66	0	0	0	0
Night sweats,	Under three months,	20	62.50	0	0	12	37.50	9	75.00	0	6	3	25.00	0	0
	Three to six months,	34	62.86	0	0	20	37.03	20	100	0	0	0	0	0	0
	Over six months,	8	61.53	0	0	5	38.46	5	100	0	0	0	0	0	0
Gastric catarrh,*.	Under three months,	20	62.50	0	0	12	37.50	8	66.66	2	16.66	2	16.66	0	0
	Three to six months,	29	53.70	1	3.79	25	46.29	20	80.00	3	12.00	2	8.00	0	0
	Over six months,	12	92.30	0	0	1	7.69	1	100	0	0	0	0	0	0

†Symptoms not recorded in one case. Patient discharged "Disease Arrested."
°Present on admission or recent history of
*Subjective symptoms of.

TABLE No. 3.—A STATISTICAL REPORT OF MODERATELY ADVANCED CASES, SHOWING THE INFLUENCE OF TREATMENT UPON THE MORE IMPORTANT SYMPTOMS.

Symptoms.	Period of treatment.	Absent on admission.	Per cent.	Developed.	Per cent.	Present on admission.	Per cent.	Disappeared.	Per cent.	Improved.	Per cent.	Unchanged.	Per cent.	Progressive.	Per cent.
Cough, ...	Under three months, ...	4	9.75	0	0	37	90.24	11	29.72	12	32.43	13	35.13	1	2.70
	Three to six months, ...	13	14.60	1	7.69	76	85.39	43	56.57	21	27.63	9	11.84	3	3.91
	Over six months, ...	1	2.63	0	0	37	97.36	20	54.05	12	32.43	3	8.10	2	5.40
Expectoration, ...	Under three months, ...	4	9.75	0	0	37	90.24	9	24.32	8	21.62	16	43.24	4	10.81
	Three to six months, ...	17	19.10	2	11.84	72	80.89	33	45.83	30	41.66	6	8.33	3	4.16
	Over six months, ...	9	23.68	3	33.33	29	76.31	10	34.48	14	48.27	5	17.24	0	0
Hoarseness, ...	Under three months, ...	22	53.65	1	4.54	19	46.34	7	36.84	4	21.05	7	36.84	1	5.26
	Three to six months, ...	53	59.55	3	5.66	36	40.44	31	86.11	2	5.55	3	8.33	0	0
	Over six months, ...	13	34.21	1	7.69	25	65.79	17	68.00	2	8.00	5	20.00	1	4.00
Haemoptysis, ...	Under three months, ...	20	48.78	0	0	°21	51.21	10	47.61	6	28.57	5	23.81	0	0
	Three to six months, ...	60	67.41	0	0	29	32.58	24	82.75	3	10.34	2	6.89	0	0
	Over six months, ...	21	55.26	0	0	17	44.73	14	82.35	3	17.64	0	0	0	0
Pleurisy,*	Under three months, ...	10	24.39	0	0	31	75.61	10	32.25	9	29.03	11	35.48	1	3.22
	Three to six months, ...	43	48.31	2	4.65	46	51.68	31	73.91	5	10.86	7	15.21	0	0
	Over six months, ...	16	42.10	1	6.25	22	57.89	17	77.27	2	9.09	3	13.63	0	0
Night sweats. ..	Under three months, ...	18	43.90	0	0	23	56.09	15	65.21	8	34.78	0	0	0	0
	Three to six months, ...	53	59.55	0	0	36	40.44	34	94.44	2	5.55	0	0	0	0
	Over six months, ...	24	63.15	0	0	14	36.84	14	100	0	6	0	0	0	0
Gastric catarrh,*.	Under three months, ...	27	65.85	3	11.11	14	31.14	6	42.85	6	42.85	2	14.28	0	0
	Three to six months, ...	35	39.32	3	8.57	54	60.67	46	85.18	2	7.40	2	7.40	0	0
	Over six months, ...	28	73.68	3	10.71	10	26.31	7	70.00	2	20.00	1	10.00	0	0

°Present on admission or recent history of

*Subjective symptoms of.

TABLE NO. 4.—STATISTICAL REPORT OF FAR ADVANCED CASES SHOWING THE INFLUENCE OF TREATMENT UPON THE MORE IMPORTANT SYMPTOMS.

Symptoms.	Period of treatment.	Absent on admission.	Per cent.	Developed.	Per cent.	Present on admission.	Per cent.	Disappeared.	Per cent.	Improved.	Per cent.	Unchanged.	Per cent.	Progressive.	Per cent.
Cough,	Under three months,	0	0	0	0	7	100	0	0	2	28.57	5	71.42	0	0
	Three to six months,	0	0	0	0	19	100	3	15.78	10	53.63	3	15.78	3	15.78
	Over six months,	0	0	0	0	19	100	3	15.78	7	36.84	5	26.31	4	21.05
Expectoration,	Under three months,	0	0	0	0	7	100	0	0	3	42.85	4	57.14	0	0
	Three to six months,	0	0	0	0	19	100	3	15.78	7	36.84	6	31.57	3	15.78
	Over six months,	0	0	0	0	19	100	3	15.78	4	21.05	7	36.84	5	26.31
Hoarseness,	Under three months,	6	85.72	0	0	1	14.27	0	0	0	0	1	100	0	0
	Three to six months,	11	57.89	1	9.09	8	42.10	5	62.50	2	25.00	1	12.50	0	0
	Over six months,	10	52.63	0	0	9	47.36	8	88.88	0	0	1	11 11	0	0
Haemoptysis,	Under three months,	3	42.85	1	33.33	†4	57.14	3	75.00	0	0	1	25.00	0	0
	Three to six months,	10	52.63	1	8.33	9	47.36	5	55.55	4	44.44	0	0	0	0
	Over six months,	9	47.36	1	11.11	10	52.63	10	100	0	0	0	0	0	0
Pleurisy,*	Under three months,	2	28.57	1	50.00	5	71.42	2	40.00	0	0	3	60.00	0	0
	Three to six months,	8	42.10	0	0	11	57.89	7	63.63	0	0	3	27.27	1	9.09
	Over six months,	9	47.36	0	0	10	52 63	6	60.00	2	20.00	2	20.00	0	0
Night sweats.	Under three months,	2	28.57	0	0	5	71.42	2	40.00	1	20.00	2	40.00	0	0
	Three to six months,	9	47.36	0	0	10	52.63	10	100	0	0	0	0	0	0
	Over six months,	10	52.63	1	10.00	9	47.36	9	100	0	0	0	0	0	0
Gastric catarrh,*.	Under three months,	3	42.85	1	33.33	4	57.14	2	50.00	2	50.00	0	0	0	0
	Three to six months,	9	47.36	0	0	10	52.63	6	60.00	3	30.00	1	10.00	0	0
	Over six months,	12	63.15	1	8.33	7	36.84	4	57.14	1	14.28	2	28.57	0	0

†Present on admission or recent history of

*Subjective symptoms of.

Following the discharge of patients from this Sanatorium, visits are made at intervals of six (6) months by nurses attached to the nearest State Tuberculosis Dispensary and reports of the condition of patients visited are forwarded to the Sanatorium.

The following table shows the condition of one hundred and eighteen (118) of the three hundred and thirteen (313) cases carried in the foregoing report, and also used in the summary on the next page.

TABLE NO. 5.—SUMMARY OF THE CONDITION OF PATIENTS REPORTED ON FROM ONE TO TWO YEARS AFTER DISCHARGE.

INCIPIENT.

Classification on Discharge.	Number of cases.	Cases followed.	Per cent.	Improved.	Per cent.	Stationary.	Per cent.	Progressive.	Per cent.	Died.	Per cent.
Apparently cured, ..	20	4	20.00	0	0.0	3	75.00	1	25.00	0	0.0
Disease arrested, ...	40	11	27.50	7	63.63	4	36.36	0	0.0	0	0.0
Improved, ...	39	13	33.33	6	46.15	4	30.76	3	23.07	0	0.0
Progressive, ...	1	1	100.00	0	0.0	1	100.00	0	0.0	0	0.0
Total, ...	100	29	29.00	13	44.82	12	41.37	4	13.79	0	0.0

MODERATELY ADVANCED.

Apparently cured, ..	27	10	37.03	5	50.00	5	50.00	0	......	0	......
Disease arrested, ...	75	35	46.66	15	42.85	14	40.00	4	11.42	2	5.71
Improved, ...	55	25	44.45	14	56.00	4	16.00	7	28.00	0	......
Progressive, ...	11	3	27.27	2	66 66	1	33.33	0	......	0	......
Total, ...	168	73	43.45	36	49.31	24	32.87	11	15.06	2	2.73

FAR ADVANCED.

Apparently cured, ..	0	0	......	0	......	0	......	0	......	0	......
Disease arrested, ...	25	9	36.00	2	22.22	6	66.66	1	11.11	0	......
Improved, ...	15	6	40.00	1	16.66	1	16.66	3	50.00	1	16.66
Progressive, ...	5	1	20.00	1	100.00	0	100.00	0	......	0	......
Total, ...	45	16	35.55	4	25.00	7	43.75	4	25.00	1	6.25

RESULTS OF TREATMENT IN THREE HUNDRED AND THIRTEEN (313) CASES OF PULMONARY TUBERCULOSIS TREATED WITH THE BIOLOGICAL PRODUCTS OF THE TUBERCLE BACILLUS DURING THE YEAR 1911.

INCIPIENT.

	Period of Treatment.	Apparent cure.	Per cent	Disease arrested.	Per cent	Improved.	Per cent	Progressive.	Per cent	Total.
Tubercle Bacilli extract.	Under three months, ...	0	0	6	25	18	75	0	0	24
	Three to six months, ...	10	25.61	18	46.15	10	25.64	1	2.56	39
	Six months or over, ...	4	44.44	5	55.55	0	0	0	0	9
Suspension dead Tub. Bac.	Under three months, ...	0	0	1	12.50	7	87.50	0	0	8
	Three to six months, ...	3	25.00	7	58.33	2	16.66	0	0	12
	Six months or over, ...	1	33.33	1	33.33	1	33.33	0	0	3
Both products.	Under three months, ...	0	0	0	0	0	0	0	0	0
	Three to six months, ...	1	25.00	2	50.00	1	25	0	0	4
	Six months or over, ...	1	100	0	0	0	0	0	0	1
	Total, ...	20	....	40	....	39	....	1	....	100

MODERATELY ADVANCED.

	Period of Treatment.	Apparent cure.	Per cent	Disease arrested.	Per cent	Improved.	Per cent	Progressive.	Per cent	Total.
Tubercle Bacilli extract.	Under three months, ...	0	0	10	30.30	19	57.57	4	12.12	33
	Three to six months, ...	11	17.74	30	48.38	18	29.03	3	4.83	62
	Six months or over, ...	10	31.25	15	46.87	6	18.75	1	3.12	32
Suspension dead Tub. Bac.	Under three months, ...	0	0	1	14.28	4	57.14	2	28.57	7
	Three to six months, ...	5	23.80	13	61.90	3	14.28	0	0	21
	Six months or over, ...	0	0	0	0	0	0	1	100	1
Both products.	Under three months, ...	0	0	0	0	1	100	0	0	1
	Three to six months, ...	1	16.66	2	33.33	3	50.00	0	0	6
	Six months or over, ...	0	0	4	80.00	1	20.00	0	0	5
	Total, ...	27	....	25	....	55	....	11	....	168

FAR ADVANCED.

Tubercle Bacilli extract.	Under three months,	0	0	1	25.00	3	75.00	0	0	4
	Three to six months,	0	0	11	61.11	6	33.33	1	5.55	18
	Six months or over,	0	0	12	63.15	3	14.28	4	14.28	19
Suspension dead Tub. Bac.	Under three months,	0	0	0	0	3	100	0	0	3
	Three to six months,	0	0	1	100	0	0	0	0	1
	Six months or over,	0	0	0	0	0	0	0	0	0
Both products.	Under three months,	....	....	....	....	....	....	....	....	....
	Three to six months,	....	....	....	....	....	....	....	....	....
	Six months or over,	....	....	....	....	....	....	....	....	....
	Total,	0	....	25	....	15	....	5	....	45

The remaining one hundred and ninety-five cases could not be traced and it appears fair to infer that the health of the majority of these patients remained such that they no longer felt the need of medical attention and as a result failed to keep in touch with the Dispensary officials.

From the results obtained in the foregoing report and from our experience and observation we are of the opinion that the conservative use of the Biological Products of the Tubercle Bacillus* is an invaluable adjunct to the hygienic and dietetic treatment of pulmonary tuberculosis.

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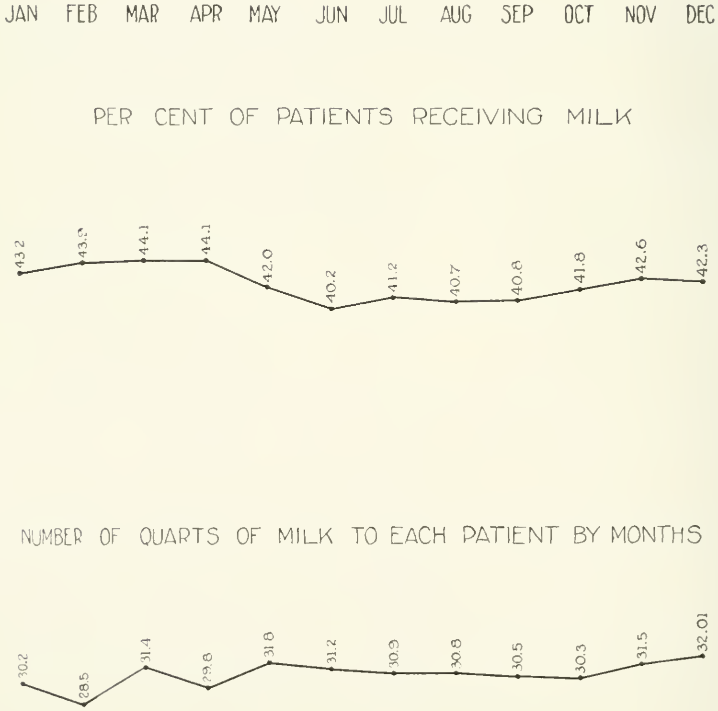
§After the method of Dr. Samuel G. Dixon (See Medical News, Oct. 19, 1889).

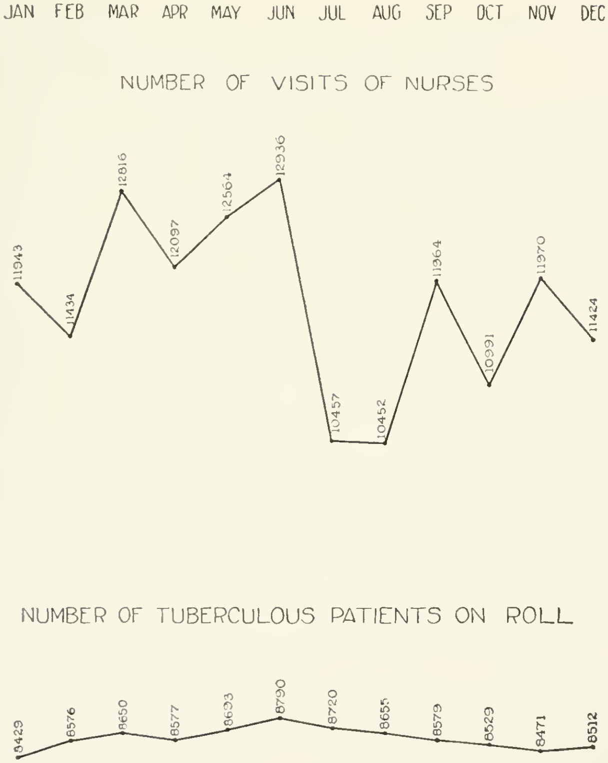
TUBERCULOSIS DISPENSARY WORK



PER CENT OF PATIENTS RECEIVING MILK

NUMBER OF QUARTS OF MILK TO EACH PATIENT BY MONTHS

TUBERCULOSIS DISPENSARY WORK



NUMBER OF VISITS OF NURSES

NUMBER OF TUBERCULOUS PATIENTS ON ROLL

SUB-DIVISION OF TUBERCULOSIS DISPENSARIES.

THOMAS H. A. STITES, M. D., Medical Inspector of Dispensaries.

The work of the Division of Tuberculosis Dispensaries during the year 1911 was conducted along the same lines as that of previous years. Previous annual reports give at some length a description of the Department's system.

During the year no additional dispensaries were opened, the number in operation being one hundred and fifteen. The equipment of the dispensaries continued practically as heretofore.

The work of the Visiting Nurses increased during the year, although no addition was made to the total number of nurses employed. The inspections of the two Visiting Dispensary Nurses, Miss O'Halloran and Miss Gillespie, were interrupted by the occurrence of a typhoid fever epidemic at Erie, and extra work in connection with the flood disaster at Austin.

The Dispensary medical staff at the end of the year consisted of 112 Physicians in Charge, 45 First Assistant Physicians and 39 Second Assistant Physicians.

The appended cross section chart shows in a graphic way the number of patients in attendance at the Dispensaries each month, the number of nurse visits to patients each month and various data concerning the milk distribution to patients and other points of interest in connection with dispensary work. It may be interesting to note in connection with these charts the following points:

The greatest number of patients taking medicine was in January, 8.9 per cent. of the enrollment for the month. There was a decline until the month of August, when it had reached 6.6 per cent.

From 40.2 per cent. to 44.1 per cent. of the enrolled patients received supplies of milk. The amount of milk given to each patient averaged between 28.5 and 32 quarts each month.

The greatest monthly average of visits made to patients' homes by dispensary nurses was in March and June, 118.6 for each nurse, or a total of 12,938 visits. The lowest average was in August, 95, or a total of 10,452.

The highest average number of dispensary visits by patients was in March, 61.6 for each physician, there being a total of 11,778 visits during the month. The lowest average was in July, 52, or a total of 9,977 visits.

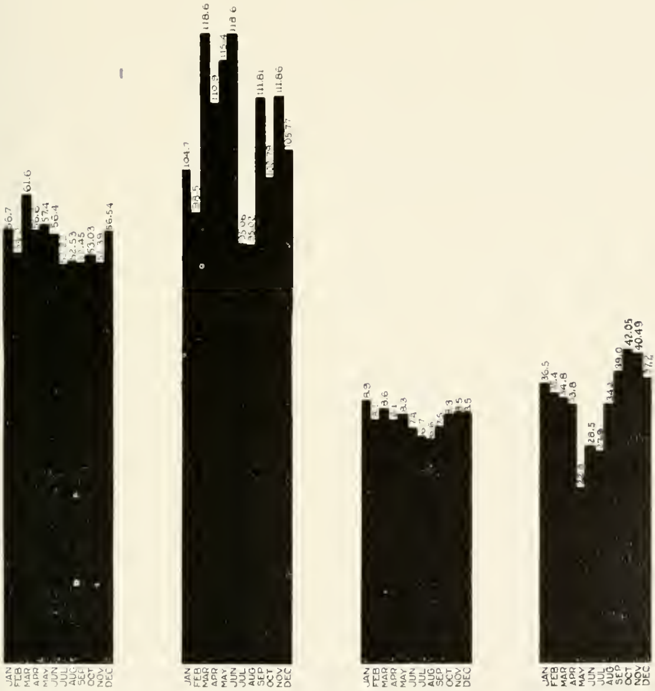
The percentage of patients showing increase of weight is greatest during the autumn months as in previous years. The comparison of the attached diagram with diagrams of similar reports would seem to direct attention to the influence of the seasons upon the change in weight of our patients.

Of the total number of patients under treatment during the year 17,492, a large number were in the advanced stage, there being no less than 1,010 deaths reported. It is gratifying also to report 715 cases discharged with the disease arrested. Attention is also drawn to the number of cases dropped from the roll, owing to their transfer to sanatoria, there being 2,130 such cases. During the year 4,336 persons applied for examination whose physical condition was such that no diagnosis of tuberculosis could be made. These individuals, were either held under observation for further examination, or were referred for treatment to other agencies. A considerable number of them proved to be cases of tuberculosis in the very early stages and were later admitted as patients.

During the year 1911, the Department made use of large quantities of cotton seed oil in the treatment of dispensary patients. This was first tried experimentally as a substitute for olive oil. It has been found that as a general thing our patients obtain just as much benefit from the cotton seed oil as from the olive oil, and the consensus of opinion of the Physicians in Charge of the various Dispensaries is that the number of patients in whom cotton seed oil caused gastric or intestinal disturbances is far less than is the case with olive oil. The Department, therefore, feels that it is justified in continuing the use of this cheaper product.

The following is a statistical report of the patients enrolled during the year 1911. A list of changes in the personnel of the Division is also attached.

TUBERCULOSIS DISPENSARY WORK



NUMBER OF DISPENSARY VISITS FOR EACH PHYSICIAN

NUMBER OF VISITS TO PATIENTS AT THEIR HOMES FOR EACH NURSE

PER CENT OF PATIENTS RECEIVING MEDICINE

PER CENT OF PATIENTS SHOWING INCREASED WEIGHT

TOTALS TUBERCULOSIS DISPENSARY WORK— ANNUAL STATEMENT. ALL DISPENSARIES, 1911.

		January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Totals.	Monthly average.
1.	On roll from previous month, ...	8,335	8,430	8,588	8,666	8,599	8,712	8,808	8,736	8,675	8,601	8,536	8,478	....	....
2.	New patients, ...	847	733	870	747	918	909	768	682	697	650	632	704	9,157	....
3.	Dropped for causes stated, ...	752	575	792	823	796	813	840	743	771	715	690	663	8,973	....
	a. Removed, ...	128	80	134	108	110	123	132	90	114	128	142	147	1,436	....
	b. No return for 2 months, ...	272	207	237	306	238	307	318	240	263	265	247	221	3,121	....
	c. Transferred to sanatoria, ...	128	108	183	212	220	201	202	218	189	164	166	139	2,130	....
3	d. Ref. to fam. phys. Non-indigent,	40	38	34	34	28	27	56	31	13	33	18	22	374	....
	e. Non-compliance with instructions,	21	5	25	14	22	18	11	14	12	14	16	15	187	....
	f. Disease arrested, ...	58	42	56	56	90	47	46	67	108	60	47	38	715	....
	g. Died, ...	105	95	123	93	88	90	75	83	72	51	54	81	1,010	....
4.	Remaining at end of month, ...	8,430	8,588	8,666	8,590	8,712	8,808	8,736	8,675	8,601	8,536	8,478	8,519	....	....
5.	Negative examinations, ...	434	423	480	373	431	358	303	327	321	308	293	285	4,336	....
6.	Examined for sanatoria, ...	242	210	245	228	331	287	316	260	247	212	197	186	2,961	....
7.	Total dispensary visits, ...	10,774	10,338	11,778	10,754	10,906	10,804	9,977	10,034	10,070	10,174	10,060	10,857	126,526	10,544
8.	Weight increased, ...	3,080	3,042	3,025	2,901	1,995	2,520	2,446	2,955	3,347	3,587	3,430	3,168	....	2,958
9.	Weight stationary, ...	1,540	1,650	1,656	1,573	1,825	1,799	1,570	1,647	1,480	1,406	1,451	1,604	....	1,600
10.	Weight decreased, ...	1,579	1,572	1,949	1,975	2,918	2,195	2,078	1,649	1,479	1,100	1,266	1,588	....	1,779
11.	Taking medicine, ...	758	701	749	700	723	656	592	576	647	712	724	729	....	689
12.	Nurse visits, ...	11,943	11,433	12,816	12,094	12,564	12,938	10,457	10,452	11,904	10,991	11,970	11,424	140,986	11,749
13.	Quarts milk ordered, ...	110,362	107,418	120,009	114,064	116,018	110,298	111,441	108,601	107,332	108,220	114,070	116,557	134,390	....
14.	Patients rec. milk only, ...	3,647	3,763	3,817	3,810	3,656	3,534	3,601	3,526	3,508	3,566	3,616	3,709	....	3,646
15.	Dozens eggs ordered, ...	7	0	0	0	8	0	3	9	0	0	0	0	....	....
16.	Patients rec. eggs only, ...	1	0	0	0	6	0	1	1	0	0	0	0	....	....
17.	Pats. rec. milk and eggs, ...	1	0	0	0	6	0	0	0	0	0	0	0	....	....
18.	Days open, ...	900	823	958	856	923	894	832	924	876	883	863	851	10,583	882

Following is a report of the Social Service Work done in our dispensaries during the year 1911.

Patients referred—

Patients referred to the dispensaries for treatment or examination through societies, hospitals, physicians, nurses, other patients, newspapers, etc., over 3,300

Our patients are sometimes referred for treatment to institutions other than the Sanatorium. The number referred to hospitals, etc., was........ 686

The number of patients referred to the various charitable organizations, who received assistance of all kinds: rent, food, clothing, etc., over...... 325

The number of members patients' families referred to other organizations, ... 273

Housing conditions—

The number of patients whose home surroundings were improved and made more sanitary or who were removed to more sanitary homes was.... 84

Number of houses supplied with fly screens, ... 52

Outdoor living—

In order to benefit the patients by outdoor living, window hoods, tents, cure chairs, blankets, cots, etc., were secured. The number of patients receiving these was 393

Some of the dispensaries have aided patients by having porches built or enclosed by means of awnings, etc.; others were benfited by outdoor sleeping shacks. The number thus helped was 18

Seashore and Country—

The number of children sent to the seashore or country during the summer months, through the dispensaries, was 43

Number of families who made visits to fresh air homes 10

Patients are urged to move to the country, if possible. The number of families thus persuaded was 10

Children—

The number of children for whom homes were secured, sometimes enabling the parents to go to Mont Alto, ... 107

- No. children referred to Society to protect children from cruelty, ... 3
- No. children placed in private homes by Children's Bureau, ... 47
- No. children placed in institutions, ... 55
- No. children sent to orphanage, ... 2

The number of children attending open air school 18

In some instances children have been taken from school for a few months until they have grown stronger.

County Poor Boards—

Orders of relief have been obtained through the County Commissioners to the amount of over $2,625

Besides these, 17 families (some receiving help every month) and over 100 patients were helped through this means, the amount of which is not stated. These orders were often in form of rent, coal, food, etc.

Organized Societies—

Our patients are often aided by different societies, both church and social. The amount of money received from such societies, insurance indemnities, etc., over $700

Many of our patients are aided by individuals. The amount of money received for this purpose from charitable persons, over $320

Money thus received was expended for food, rent, sometimes for transportation to Mount Alto.

Transportation to Mt Alto—

Many of our patients referred to the Sanatorium are given transportation to Mont Alto by Poor Boards, societies or individuals. Number of patients receiving such aid (nurse accompanying them if necessary), ... 112

The number of patients supplied with suitable clothing to go to the Sanatorium, ... 350

Employment—

The number of patients finding suitable employment through the dispensaries at their discharge from dispensary or Sanatorium, ... 155

Miscellaneous Donations.

Clothing—

Number pieces clothing received and distributed among dispensary patients, including shoes, overshoes, underclothing, dresses, coats, etc., .. 3,500

Food—

Value of food supplies received by patients, over $460

Besides this, 11 families are reported receiving food, (some every week), the value of which is not stated.

Coal—	
Amount of coal received by patients,	140 T.
In addition, 57 families received coal from various societies, amounts not stated. In other instances, coal was given them at half price.	
Bedding Furniture—	
Number pieces bedding distributed to patients, over	400
Necessary furniture was also supplied some patients.	
Christmas entertainment—	
Christmas festivities were observed in 14 of our dispensaries; trees being trimmed in some of them and gifts distributed among the children. Number of children receiving candy, oranges, toys, gloves, etc., over	675
Number patients supplied with Christmas dinners,	71
Besides these, baskets filled with Christmas dinners were distributed to patients and their families.	
Number of families receiving such were	128

THE TUBERCULOSIS EXHIBIT.

On January 2nd, 1911, the exhibit was opened to the public in the ground floor auditorium of the Academy of Natural Sciences, 1900 Race Street, Philadelphia. It was open every day during the week until Saturday night, January 7th. The daily attendance was in the neighborhood of one thousand persons. At various hours each day, there were illustrated lectures on tuberculosis and the Department's work in combating the disease, the number of lectures depending upon the number of persons present. These illustrated talks were given by the Commissioner of Health, Dr. J. C. Foltz, Dr. W. G. Turnbull, Dr. Karl Schaffle, Miss Alice M. O'Halloran and the Medical Inspector of Dispensaries. On the evening of Wednesday, January 4th, a formal lecture was delivered by Dr. E. M. Green of Easton, and on the evening of Saturday, January 7th, a similar lecture was given by Dr. A. P. Francine of Philadelphia.

By special request of the authorities of the Academy of Natural Sciences, the exhibit material was left in place and used for demonstration purposes by Dr. Seneca Egbert at some lectures which he delivered during the following week.

The exhibit was then stored in the basement of the Academy of Natural Sciences, remaining there until the latter part of June when it was shipped to State College, Pennsylvania.

At State College it was set up for public view at the Summer Teacher's School, and was on exhibition from July 3rd to 8th inclusive. Much interest was exhibited by those who were in attendance. There were no formal lectures in direct connection with the exhibit, but the various pieces were carefully demonstrated by a number of Department employees.

By direction of the Commissioner of Health, the exhibit was then handed over by the Medical Inspector of Dispensaries to the charge of Dr. William C. Miller, who had been appointed Lecturer and Manager of the Tuberculosis Exhibit. Dr. Miller's report on the work of the exhibit will be found on page 991 of this document.

CHANGES IN PERSONNEL, DIVISION OF TUBERCULOSIS DISPENSARIES.

APPOINTMENTS.

Name.	Position.	Place.	Date.
Dr. W. C. Miller,	Lecturer and Manager of the Tuberculosis Exhibit	Harrisburg office,	June 1, 1911.
Dr. Malcolm Guthrie,	Second ass't. physician,	Wilkes-Barre dispensary,	Jan. 1, 1911.
Dr. W. J. McGuire,	Assistant physician,	Wilkes-Barre dispensary,	May 15, 1911.
Dr. J. B. Howe,	Substitute physician,	Erie dispensary,	July 1, 1911.
Dr. C. J. B. Flowers,	Second ass't. physician,	Harrisburg dispensary,	Oct. 1, 1911.
Dr. W. J. McMullen,	Second ass't. physician,	Harrisburg dispensary,	Oct. 1, 1911.
Dr. H. P. St. Clair,	First ass't. physician,	Butler dispensary,	May 1, 1911.
Dr. J. Mackrell,	Second ass't. physician,	Pittsburgh dispensary,	Feb. 15, 1911.
Dr. T. B. Johnson,	Physician in charge,	Towanda dispensary,	March 21, 1911.
Dr. C. W. Schmehl,	Physician in charge,	Warren dispensary,	Nov. 1, 1911.
Dr. S. M. Beyer,	Physician in charge,	Punxsutawney dispensary,	Sept. 27, 1911.
Dr. H. L. Ransom,	First ass't. physician,	Pittston dispensary,	Aug. 1, 1911.
Mrs. K. Worthington,	Nurse,	Chester dispensary,	Jan. 21, 1911.
Miss Anna Kutzer,	Nurse,	Harrisburg dispensary,	Feb. 2, 1911.
Miss Bertha Brown,	Nurse,	Harrisburg dispensary,	Oct. 15, 1911.
Miss Elsie Hatfield,	Nurse,	Harrisburg dispensary,	July 26, 1911.
Miss M. G. Connelly,	Nurse,	Danville dispensary and Selinsgrove dispensary,	Dec. 1, 1911.
Miss Birdena Ross,	Nurse,	Oil City dispensary,	July 15, 1911.
Miss Anna Grafe,	Nurse,	Oil City dispensary,	Nov. 1, 1911.
Miss A. M. Lafferty,	Nurse,	Phoenixville dispensary and Pottstown dispensary,	July 1, 1911.
Miss F. A. Rooker,	Nurse,	Towanda dispensary and Dushore dispensary,	April 10, 1911.
Miss Anna L. Hart,	Nurse,	Mauch Chunk dispensary and Allentown dispensary,	Nov. 1, 1911.
Miss Jessie Ross,	Nurse,	Tunkhannock dispensary and Pittston dispensary,	April 1, 1911.
Miss E. Williams,	Substitute nurse,	Clearfield dispensary,	April 1, 1911.
Miss Ellen Sidwell,	Nurse,	Carnegie dispensary and Homestead dispensary,	Feb. 15, 1911.
Miss Veronica D. Kusiekiewicz.	Nurse,	Shenandoah dispensary,	Nov. 1, 1911.
Mr. C. E. Middleton,	Exhibit assistant,	Harrisburg office,	June 1, 1911.
Mr. S. S. Long,	Chief clerk,	Harrisburg office,	Sept. 1, 1911.
Miss Sarah Dickinson,	Clerk,	Harrisburg office,	July 18, 1911.

DEATHS.

Dr. J. A. Bouse,	Lecturer for the Tuberculosis Exhibit.	Harrisburg office,	March 29, 1911.
Dr. G. F. Harris,	Physician in charge,	Bellefonte dispensary,	Sept. 11, 1911.
Dr. S. M. Woodburn,	Physician in charge,	Towanda dispensary,	Feb. 23, 1911.

TRANSFER.

Name.	Position.	Place to which transferred.	Date.
Mr. C. N. Fry,	Manager of Tuberculosis Exhibit.	Bureau of Vital Statistics,	Jan. 1, 1911.

CHANGES IN PERSONNEL, DIVISION OF TUBERCULOSIS DISPENSARIES—CONTINUED.

RESIGNATIONS.

Name.	Position.	Place.	Date.
Dr. J. P. Reynolds,	Statistican,	Harrisburg office,	Jan. 1, 1911.
Dr. Malcolm Guthrie,	Second ass't. physician,	Wilkes-Barre dispensary,	July 18, 1911.
Dr. J. H. Bennett,	First ass't. physician,	York dispensary,	Feb. 1, 1911.
Dr. J. W. Ellenberger,	First ass't. physician,	Harrisburg dispensary,	June 1, 1911.
Dr. T. M. Maxwell,	First ass't. physician,	Butler dispensary,	Sept. 16, 1911.
Dr. M. V. Ball,	Physician in charge,	Warren dispensary,	Nov. 1, 1911.
Dr. J. E. Grube,	Physician in charge,	Punxsutawney dispensary,	Sept. 30, 1911.
Dr. M. C. Gaughan,	First ass't. physician,	Pittston dispensary,	April 3, 1911.
Mrs. Nettie Kepple,	Nurse,	York dispensary,	July 10, 1911.
Mrs. Katharine Wells,	Nurse,	Harrisburg dispensary,	Nov. 1, 1911.
Miss Anna Kuhnast,	Nurse,	Harrisburg dispensary,	Sept. 1, 1911.
Miss Alice Kuhn,	Nurse,	Pittsburgh dispensary,	Sept. 16, 1911.
Miss Margaret Shade,	Nurse,	Danville dispensary and Selinsgrove dispensary,	Nov. 1. 1911.
Miss Rose Laughton,	Nurse,	Oil City dispensary,	Aug. 1, 1911.
Miss Mary E. Birchard,	Nurse,	Oil City dispensary,	Nov. 1. 1911.
Miss Emma McNamara,	Nurse,	New Castle dispensary,	March 1, 1911.
Mrs. Mary R. Green,	Nurse,	Reading dispensary,	Oct. 26, 1911.
Miss M. L. Jenkins,	Nurse,	Mauch Chunk dispensary and Allentown dispensary,	Nov. 1. 1911.
Miss M. Reynolds,	Nurse,	Tunkhannock dispensary and Pittston dispensary,	April 1, 1911.
Miss May Engle,	Nurse,	Phoenixville dispensary,	July 1, 1911.
Miss Alice Hyland,	Nurse,	Carnegie dispensary and Homestead dispensary,	Jan. 12, 1911.
Miss Grace Kantner,	Nurse,	Shenandoah dispensary,	Sept. 15, 1911.
Miss Sibyl Moorhead,	Stenographer,	Chester dispensary,	Sept. 30, 1911.
Mr. C. H. Cobaugh,	Ass't. Manager Tuberculosis Exhibit.	Harrisburg office,	Jan. 1, 1911.
Mr. G. K. Strode,	Chief clerk,	Harrisburg office,	Sept. 15, 1911.
Miss Josephine P. Hill,	Stenographer,	Harrisburg office,	May 1, 1911.
Miss Mary Fitzpatrick,	Clerk,	Harrisburg office,	June 1, 1911.

DIRECTORY, TUBERCULOSIS DISPENSARIES.

County.	Town.	Address.	Days and Hours.
Adams,	Gettysburg,	No. 135 Baltimore St.,	Tues., 2-4.
Allegheny,	Braddock,	812 Braddock Ave.,	Mon., Fri., 2-4.
	Carnegie,	10 4th Ave.,	Mon., 3-4.
	Homestead,	318 8th Ave.,	Wed., 2-4.
	McKeesport,	8th and Market Sts.,	Tues., Fri., 2-4.
	Pittsburgh,	510 Diamond St.,	Daily, 3-5.
	Tarentum,	National Bank Building,	Tues., Thurs., 2-5.
	Wilkinsburg,	1001 Penn Ave.,	Mon., Thurs., 2-4.
Armstrong,	Kittanning,	106 McKean St.,	Mon., Fri., 2-4.
Beaver,	Beaver Falls,	1621 7th Ave.,	Mon., Thurs., 2-3.
	Rochester,	Trust Co. Building,	Tues., Fri., 3-4.
Bedford,	Everett,	Main and Spring Sts.,	Fri., 1-3.
Berks,	Reading,	537 Buttonwood St.,	Wed., Sat., 3-4.
Blair,	Altoona,	1212 12th St.,	Tues., Fri., 2 P. M.
	Tyrone,	18 E. 10th St.,	Wed. 2.30-3.30.
Bradford,	Towanda,	Office of Dr. T. B. Johnson,	Thurs., 1-3.
Bucks,	Bristol,	114 N. Main St.,	Tues., 11-12.
	Doylestown,	Mill and Cedar Sts.,	Wed., 2-4.
Butler,	Butler,	129 E. Diamond St.,	Tues., Fri., 10-12, 1-4.30.
Cambria,	Hastings,	4th Ave., between Beaver an Spangler,	Wed., 10-12.
	Johnstown,	440 Lincoln St.,	Tues., Fri., 2-4.
Cameron,	Emporium,	Office of Dr. H. S. Falk,	Fri., 1-4.
Carbon,	Lansford,	Tunnell St.,	Mon., Wed., 3-5.
	Mauch Chunk,	National Bank Building,	Tues., 10.30-11.30.
Centre,	Bellefonte,	25 W. High St.,	Tues., Thurs., 2-5.
	Philipsburg,	Potter Arcade,	Tues., 11-12.

DIRECTORY, TUBERCULOSIS DISPENSARIES—Continued.

County.	Town.	Address.	Days and Hours.
Chester,	Coatesville,	11 N. 3rd Ave.,	Tues., Thurs., 2-4.
	Phoenixville,	215½ Church St.,	Thurs., 2-4.
	West Chester,	122 Market St.,	Wed., Fri., 2-3.
Clarion,	Clarion,	Main St. and 5th Ave.,	Tues., 1-2.
Clearfield,	Clearfield.	302 Market St.,	Thurs., 10.30-12.30.
	DuBois.	2 S. Main St.,	Mon., Wed. 2-4.
Clinton,	Lock Haven,	E. Water St.,	Thurs., 2-3.
	Renovo,	Erie Ave., bet. 5th & 6th Sts.,	Tues., 2-3.
Columbia,	Berwick,	108 W. 2nd St.,	Thurs., 8-12.
	Bloomsburg,	129 W. Main St.,	Wed., 8-11 a. m.
Crawford,	Meadville,	271 Arch St.,	Mon., Thurs., 3-4.
	Titusville,	Spruce Place,	Fri., 11-12.
Cumberland,	Carlisle,	51 E. High St.,	Tues., Fri., 12-2.
	West Fairview,	Office of Dr. H. B. Bashore,	Wed., 2-4.
Dauphin.	Harrisburg,	202 Locust St.,	Daily, 1-4.
	Lykens,	252 Main St.,	Wed., 1-3.
Delaware,	Chester,	310 Edgemont Ave.,	Daily ex. Sat., 2-4.
Elk,	Ridgway,	325 Main St.,	Fri., 11-12 & 1-2.
Erie,	Corry,	45 N. Center St.,	Fri., 1-2.
	Erie,	510 State St.,	Tues., Sat., 3-5.
Fayette,	Brownsville,	High & Bridge Sts.,	Tues., 3-4.
	Connellsville,	2nd National Bank Building,	Wed., 10-12.
	Uniontown,	57 W. Main St.,	Tues., 12.30 to 1.30.
Forest,	Tionesta,	Office of Dr. F. J. Bovard,	Sat., 9-10.
Franklin,	Chambersburg,	Chbg. Trust Co. Building,	Fri., 1-3.
	Waynesboro,	Main and Potomac Sts.,	Mon., Thurs., 1-3.
Fulton,	McConnellsburg,	Office of Dr. J. W. Mosser,	By appointment.
Greene,	Waynesburg,	Office of Dr. J. T. Iams,	Thurs., 1-3.
Huntingdon,	Huntingdon,	516 Penn St.,	Mon., Fri.. 1.30-3.30.
Indiana,	Indiana,	724 Philadelphia St.,	Wed., 11-12.
Jefferson,	Brookville,	205 Main St.,	Fri., 3-4.
	Punxsutawney,	Walnut & Mulberry Sts.,	Mon., 11-12.
Juniata,	Mifflintown,	Main and Orange Sts.,	Tues., Fri., 2-4.
Lackawanna,	Carbondale,	35 N. Church St.,	Fri., 2-3.
	Scranton,	137 Adams Ave.,	Mon., Wed., Fri., 2-4.
Lancaster,	Columbia,	467 Locust St.,	Thurs., 3-5.
	Lancaster,	14 S. Prince St.,	Tues., Fri., 3-5.
Lawrence,	New Castle,	77 E. North St.,	Mon., Wed., Fri., 1-4.
Lebanon,	Lebanon,	110 N. 9th St.,	Wed., 9-12. Sat.. 2-5.
Lehigh,	Allentown,	118 N. 5th St.,	Mon., Wed., Fri., 3-5.
Luzerne,	Hazleton,	17 S. Wyoming Ave.,	Tues., Wed., 1-3.30.
	Nanticoke,	156 E. Green St.,	Tues., Fri., 2-4.
	Pittston,	80 N. Main St.,	Mon., Thurs., 3-5.
	Wilkes-Barre,	184 S. Washington St.,	Daily, 3-5.
Lycoming,	Williamsport,	164 Pine St.,	Wed., Sat., 10-2.
McKean,	Bradford,	7 Main St.,	Fri., by appointment.
	Kane,	Eckel's Block, Fraley St.,	Wed., 2-3.
Mercer,	Sharon,	7 Dock St.,	Tues., Fri., 10-12.
Mifflin,	Lewistown,	49 W. Market St.,	Tues., Fri., 11-1.
Monroe,	Stroudsburg,	304 Main St.,	Tues., 2-3.
Montgomery,	Jenkintown,	Summit Ave.,	Fri., 1-2.
	Norristown,	415 Swede St., Bean Building,	Mon., Fri., 2-30-4.30.
	Pottstown,	354 High St.,	Thurs., 1-3.
Montour,	Danville,	110 Bloom St.,	Tues., Fri., 2-4.
Northampton,	Bangor,	20 Market St.,	Mon., Thurs., 2-3.
	Easton,	222 Ferry St.,	Mon., Fri., 4-5.
	S. Bethlehem,	126 W. Fourth St.,	Tues., Thurs., 3-5.
Northumberland,	Milton,	1 Bound Ave.,	Tues., Fri., 2-3.
	Mt. Carmel,	Syndicate Building,	Wed., Fri., Sat., 1-3.
	Shamokin,	41 E. Independent St.,	Tues., Fri., 10-12.
	Sunbury,	26 N. 4th St.,	Mon., Thurs., 2-4.
Perry,	New Bloomfield,	Office of Dr. A. R. Johnston,	2 P. M., by appointment.
Philadelphia,	Frankford,	1731 Orthodox St.,	Mon., Wed., Fri., 11-1.
	Philadelphia,	12 S. 17th St.,	Daily, 11-1.
Pike,	Milford,	Office of Dr. W. B. Kenworth,	2-4. by appointment.
Potter,	Coudersport,	Office of Dr. E. H. Asheraft,	By appointment.
Schuylkill,	Pottsville,	121 Mahantonga St.,	Tues., Thurs., Fri., 2-4.
	Shenandoah,	Main and Oak Sts.,	Daily ex. Mon., 8-10 a. m
	Tamaqua,	8 Hunter St.,	Tues., 3-5.
Snyder,	Selinsgrove,	106 Market St.,	Wed., 9-11.
Somerset,	Meyersdale,	Office of Dr. C. P. Large,	Wed., 2-4.
Sullivan,	Dushore,	Kline's Opera House,	Wed., 11-12.
Susquehanna,	Montrose,	Chestnut St.,	By appointment.
	Susquehanna,	16 E. Main St.,	Sat., 2-3.
Tioga,	Tioga,	Office of Dr. S. P. Hakes,	Sat., 12-1.
	Wellsboro,	15 Central Ave.,	Thurs., 2-3.
Union,	Mifflinburg,	Office of Dr. C. H. Dimm,	Tues., 12-1.
Venango,	Franklin,	1115 Elk St.,	Wed., Thurs., 1-3.
	Oil City,	12 E. First St.,	Mon., Fri., 12.30-2.
Warren,	Warren,	City Hall,	Fri., 5-6.
Washington,	Monongahela,	426 Main St.,	Thurs., 2-4.
	Washington,	127 S. Main St.,	Mon., Wed., Fri., 1-3.
Wayne,	Honesdale,	907 Main St.,	Tues., 2-3.
Westmoreland,	Greensburg,	Coulter Building,	Tues., 2-5.
	Mt. Pleasant,	Braddock Building,	Fri., 3-4.
	Monessen,	Venneri Building,	Wed., Fri., 2-4.
Wyoming,	Tunkhannock,	Tioga and Bridge Sts.,	Mon., 1-3.
York,	Hanover,	328 Franklin St.,	Tues., Fri., 2.30-4.30.
	York,	25 N. Duke St.,	Mon., Wed., Fri., 3-5. Tues., 7-9 p. m.

STATISTICAL REPORT OF TUBERCULOSIS DISPENSARIES FOR THE YEAR ENDING DECEMBER 31, 1911.

Total number of examinations recorded,	12,391	
Tuberculous,	9,151*	
Tuberculous males,	4,671	51.04 per cent.
Tuberculous females,	4,480	48.96 per cent.
Non-tuberculous recorded,	2,803	
Indeterminate,	437	

*This does not include six cases enumerated in the table on p. 974, but which proved to be non-tuberculous.

CLASSIFICATION.

	Males.	Females.	Total.
Incipient,	1,589	1,745	3,334
Advanced,	1,825	1,673	3,498
Far advanced,	1,257	1,062	2,319
Grand total,	4,671	4,480	9,151

CIVIL CONDITIONS.

Single,	4,630	50.59 per cent.
Married,	3,919	42.8 per cent.
Widowed,	440	
Divorced,	42	
Separated,	54	
Not stated,	66	
Grand total,	9,151	

COLOR.

	Males.	Per cent. of all cases.	Females.	Per cent. of all cases.	Total.	Total, per cent.
White,	4,407	48.1	4,283	46.8	8,690	95.0
Colored,	263	2.9	194	2.1	457	5.0
Not stated,	1	....	3	....	4	....
Grand total,	4,671	....	4,480	....	9,151	....

NATIVITY.

	Males.	Per cent of all males.	Females.	Per cent of all females.	Total.	Total per cent.
United States,	3,326	70.9	3,664	81.8	6,990	76.4
Ireland,	142	....	94	....	236	....
Germany,	87	....	99	....	186	....
Austria,	470	....	218	....	688	....
Russia,	200	....	106	....	306	....
England-Scotland,	85	....	81	....	166	....
Italy,	141	....	86	....	227	....
Other,	213	....	125	....	338	....
Not stated,	7	....	7	....	14	....
Total foreign born,	1,345	28.9	816	18.2	2,161	23.6

AGE PERIODS AND STAGE OF DISEASE.

Period:	Males.	Females.	Total Males and Females.	Total by Periods.
Under 5 years—				
Incipient,	61	62	123	....
Advanced,	13	8	21	....
Far advanced,	18	9	27	171
5 to 9 years—				
Incipient,	254	234	488	....
Advanced,	55	42	97	....
Far advanced,	49	68	117	702
10 to 14 years—				
Incipient,	263	167	430	....
Advanced,	77	89	166	....
Far advanced,	65	79	144	740
15 to 19 years—				
Incipient,	198	259	457	....
Advanced,	185	149	334	....
Far advanced,	141	134	275	1066
20 to 24 years—				
Incipient,	226	254	480	....
Advanced,	279	271	550	....
Far advanced,	170	174	344	1374
25 to 29 years—				
Incipient,	206	241	447	....
Advanced,	315	273	588	....
Far advanced,	179	178	357	1392
30 to 34 years—				
Incipient,	118	193	311	....
Advanced,	261	228	489	....
Far advanced,	158	125	283	1083
35 to 39 years—				
Incipient,	99	129	228	....
Advanced,	43	355	398	....
Far advanced,	163	101	264	890
40 to 44 years—				
Incipient,	68	97	165	....
Advanced,	199	103	302	....
Far advanced,	106	60	166	633
45 to 49 years—				
Incipient,	39	49	88	....
Advanced,	154	74	228	....
Far advanced,	75	48	123	439
50 to 59 years—				
Incipient,	42	43	85	....
Advanced,	179	33	212	....
Far advanced,	93	54	147	441
60 years and over—				
Incipient,	15	17	32	....
Advanced,	65	48	113	....
Far advanced,	40	32	72	217
Grand total,	....	....	....	9151

OCCUPATIONS—MALES.

Occupations.	Native.	Foreign.	Total.
Under occupational age,	741	42	783
No occupation,	134	20	154
Unclassified,	355	48	403
Not stated,	32	6	38
PROFESSIONAL GROUP—			
Architects, Artists, Teachers of Art,	1	0	1
Clergymen,	2	1	3
Engineers, Surveyors,	2	0	2
Journalists,	1	0	1
Lawyers,	1	0	1
Musicians, Teachers of Music,	12	2	14
Physicians, Surgeons,	1	0	1
Teachers, (school),	9	0	9
Not specified,	26	1	27
MERCHANT AND TRADING GROUP—			
Apothecaries, Pharmacists,	2	0	2
Commercial travelers,	42	13	55
Merchants, dealers,	19	13	32
Hucksters, peddlers,	9	26	35
Not specified,	7	0	7
CLERICAL AND OFFICIAL GROUP—			
Bookkeepers, clerks, copyists,	164	19	183
Bankers, brokers, officers of companies,	3	0	3
Collectors, agents, auctioneers,	15	1	16
Not specified,	14	0	14
PUBLIC ENTERTAINMENT GROUP—			
Hotel, boarding-house keepers,	7	2	9
Saloon keepers, liquor dealers, bartenders,	12	5	17
Not specified,	28	5	33
PERSONAL SERVICE GROUP—			
Barbers, hair dressers,	49	6	55
Janitors, sextons,	20	0	20
Policemen, watchmen, detectives,	11	2	13
Soldiers, sailors, marines,	8	1	9
Not specified,	22	2	24
LABORING AND SERVANT GROUP—			
Laborers (not agricultural),	414	574	988
Servants,	0	0	0
MANUFACTURING AND MECHANICAL INDUSTRY GROUP—			
Bakers, confectioners,	16	6	22
Blacksmiths,	26	10	36
Boot and shoe makers,	10	12	22
Brewers, distillers, rectifiers,	1	1	2
Butchers,	10	3	13
Cabinet-makers, upholsters,	15	1	16
Carpenters, joiners,	60	9	69
Cigar-makers, tobacco-workers,	33	6	39
Clock and watch repairers, jewelers,	4	4	8
Compositors, printers, pressmen,	42	4	46
Coopers,	8	2	10
Engineers, firemen (not R. R.),	25	10	35
Glass blowers, glass workers,	28	4	32
Hat and cap makers,	0	0	0
Iron and steel workers,	125	38	163
Leather makers,	6	2	8
Leather workers,	8	0	8
Machinists,	122	37	159
Marble and stone cutters,	16	21	37
Masons,	22	5	27
Mill and factory operatoves (textile),	67	114	181
Millers (flour and grist),	8	0	8
Painters, glaziers,	56	4	60
Plasterers,	6	0	6
Plumbers, gas and steam fitters,	26	4	30
Tailors,	13	36	49
Tinners and tin ware makers,	7	3	10
Not specified,	21	3	24
AGRICULTURAL AND TRANSPORTATION GROUP—			
Boatmen, canalmen,	0	0	0
Draymen, hackmen, teamsters,	81	15	96
Farmers, planters, farm laborers,	94	1	95
Gardeners, florists, nurserymen,	12	3	15
Livery keepers, hostlers,	7	1	8
Lumbermen, raftsmen,	2	0	2
Miners, quarrymen,	77	193	270
Sailors, pilots, fishermen,	1	0	1
Stockmen, herders, drovers,	0	0	0
Steam railroad employees	82	3	85
Not specified	26	1	27

OCCUPATIONS—FEMALES.

Occupations.	Native.	Foreign.	Total.
Under occupational age,	764	50	814
No occupation,	164	10	174
Unclassified,	27	8	35
Not stated,	18	5	23
Artificial flower and paper box makers,	4	1	5
Bookkeepers, clerks, copyists,	111	3	114
Cigar and tobacco workers,	32	35	67
Dress-makers, seamstresses,	76	15	91
Hotel and boarding house keepers,	3	0	3
Laundresses,	50	4	54
Milliners,	10	0	10
Mill and factory operatives,	248	119	367
Musicians, teachers of music,	5	0	5
Nurses, midwives,	20	3	23
Housewives (not servants),	1513	328	1841
Housekeepers,	208	32	240
Stenographers and typewriters,	23	1	24
School teachers,	21	1	22
Telegraph and telephone operators,	29	1	30
Servants,	266	103	369
Others,	62	80	142
Not stated,	10	17	27

FAMILY HISTORY.

Patients giving tuberculous family history,	4,647	50.8%
Patients giving negative family history,	4,432	48.4%
Family history not stated,	72	

AGE PERIODS OF PATIENTS HAVING TUBERCULOUS FAMILY HISTORY.

Age Periods.	Total Males and Females.
Under 1 year,	13
1-2,	10
2-3,	25
3-4,	34
4-5,	68
5-9,	502
10-14,	548
15-19,	540
20-24,	646
25-29,	621
30-34,	474
35-39,	388
40-44,	285
45-49,	184
50 and over,	309
Total,	4,647

Average age, both sexes, 25.7 years.

FAMILY CLASSIFICATION.

Patients reporting tuberculosis in mother or mother's family only,	995	21.4%
Patients reporting tuberculosis in father or father's family only,	760	16.3%
Patients reporting tuberculosis in brothers or sisters only,	891	19.1%
Patients reporting tuberculosis in children's or consort's family only,	430	9.2%
Patients reporting tuberculosis in two or more of the above classifications,	1,571	33.8%

FAMILY HISTORY—Continued.

RELATIVES AFFECTED.

Relatives.	Total.
Father,	1,026
Brother,	1,215
Paternal aunt,	517
Paternal uncle,	439
Paternal grandfather,	215
Paternal grandmother,	180
Consort,	469
Consort's family,	1,281
Mother,	1,281
Sister,	1,395
Maternal aunt,	702
Maternal uncle,	454
Maternal grandfather,	237
Maternal grandmother,	285
Children,	397
Not stated,	0
Total,	8,855

NUMBER OF TURBERCULOUS RELATIVES REPORTED BY EACH PATIENT.

Number Tuberculous Relatives of Each Patient.	No. of Patients.	Total No. of Tuberculous Relatives.
1,	2,370	2,370
2,	1,277	2,554
3,	589	1,767
4,	240	960
5,	101	505
6,	52	312
7,	24	168
8,	24	192
9,	3	27
Grand total of tuberculous relatives,	....	8,855

TYPE OF DISEASE IN FAMILY.

Lungs,	4,608	97.7%
Glands,	14	
Bones, joints,	29	
Other,	63	

ENVIRONMENT OF PATIENTS. SOURCE OF CONTAGION.

	Total.	Per Cent.
Unknown,	4,058	44.3
Known,	5,093	55.7
Family,	3,420	
Friends,	1,053	
At work,	579	
Other,	223	
Not stated,	44	

ENVIRONMENT—Continued.

CHARACTER OF PRESENT DWELLING.

Private,	7,832
Apartment,	686
Tenement,	390
Boarding-house,	137
Not stated,	106

LENGTH OF TIME IN PRESENT DWELLING.

Under 1 year,	3,593
1-2,	1,170
2-3,	927
3-4,	644
4-5,	492
5-9,	1,280
10 and over,	933
Not stated,	112

HISTORY OF TUBERCULOSIS IN FORMER OCCUPANTS OF DWELLING.

Unknown,	8,386
Known,	660
Not stated,	105

DURATION OF SICKNESS BEFORE FIRST VISIT TO DISPENSARY.

	Cases.
Under 3 months,	627
3-4-5,	904
6-7-8,	1,189
9-10-11,	1,063
12-17,	1,394
18-23,	603
24-36,	1,336
Over 3 years,	1,804
Not stated,	231

Average length of time (males and females), 10.5 months.

COMPLICATIONS.

	Tuberculous.	Non-Tuberculous.	Total.
Nose, throat,	241	250	491
Extremities,	20	5	25
Heart,	0	302	302
Stomach,	0	26	26
Abdomen,	5	6	11
Anal Fistula,	14	....	14
Anal Fissure,	2	....	2
Other organs,	426	668	1094

FAMILY INCOME.

Amount of Monthly Income.	Present		Usual	
	Average monthly income.	Number of patients.	Average monthly income.	Number of patients.
Under $5,	$2.50	2,221	$2.50	1,027
5-10,	7.50	448	7.50	355
10-15,	12.50	365	12.50	353
15-20,	17.50	557	17.50	557
20-25,	22.50	554	22.50	603
25-30	27.50	625	27.50	829
30-35,	32.50	632	32.50	707
35-40,	37.50	1,047	37.50	1,263
40-45,	42.50	490	42.50	574
45-50,	47.50	661	47.50	881
50-55,	52.50	186	52.50	229
55-60,	57.50	448	57.50	654
60-65,	62.50	121	62.50	148
65-70,	67.50	125	67.50	130
Over $70,	72.50	351	72.50	510
Not stated,	....	320	....	331

Average present monthly family income,	$26 74
Average present monthly income per capita,	6 68
Average usual monthly family income,	32 36
Average usual monthly income per capita,	8 08
Average number of members of family,	4

TOTAL NUMBER OF MEMBERS IN EACH FAMILY.

Members of Family	Family Represented
1,	1616
2,	1073
3,	1293
4,	1374
5,	1137
6,	969
7,	671
8,	426
9,	258
10,	136
Over 10,	89
Not stated,	109

Average number of members in family, 4.

EARNING CAPACITY OF WAGE EARNING PATIENTS.

Not impaired,	1912
Slightly impaired (¼ diminished),	1960
Greatly impaired (¼ to ¾ diminished),	1711
Totally lost,	1787

PHYSICAL MEASUREMENTS.

(Patients over 18 years of age only.)

HEIGHT.	Males.	Females.	Total.
Under 4 feet 6 inches,	0	8	8
4 feet 6 inches to 4 feet 9 inches,	4	23	27
4 feet 9 inches to 5 feet 1 inch,	12	269	281
5 feet 1 inch,	38	398	436
5 feet 2 inches,	83	524	607
5 feet 3 inches,	166	537	703
5 feet 4 inches,	298	536	834
5 feet 5 inches,	380	420	800
5 feet 6 inches,	529	294	823
5 feet 7 inches,	558	144	702
5 feet 8 inches,	491	72	563
5 feet 9 inches,	398	28	426
5 feet 10 inches,	255	11	266
5 feet 11 inches,	136	6	142
6 feet,	79	0	79
6 feet 1 inch,	47	0	47
6 feet 2 inches,	14	0	14
6 feet 3 inches,	8	0	8
Over 6 feet 3 inches,	5	0	5
Not stated,	48	114	162

Average height of males 5 feet 7 inches.
Average height of females 5 feet 3¼ inches.
Average height of males and females 5 feet 5 inches.

MEASUREMENT OF CHEST.

Antero-posterior Diameter	Males.	Females.	Total.
6 inches,	30	198	228
7 inches,	416	1,337	1,753
8 inches,	1,710	1,334	3,044
9 inches,	965	287	1,252
10 inches,	158	30	188
11 inches,	30	3	33
12 inches,	5	1	6
Not stated,	244	194	438

Average antero-posterior diameter, males, 7.3 inches.
Average antero-posterior diameter, females, 6.6 inches.
Average antero-posterior diameter, both sexes, 6.9 inches.

MEASUREMENTS OF CHEST.

Transverse Diameters.	Males.	Females.	Total.
6 inches,	2	4	6
7 inches,	13	71	84
8 inches,	141	751	892
9 inches,	1,071	1,708	2,779
10 inches,	1,546	556	2,102
11 inches,	453	81	534
12 inches,	78	15	93
13 inches,	8	3	11
14 inches,	2	1	3
Not stated,	244	194	438

Average transverse diameter, males, 9.9 inches.
Average transverse diameter, females, 8.9 inches.
Average transverse diameter both sexes 9.4 inches.

AVERAGE RELATIONSHIP ANTERO-POSTERIOR TO TRANSVERSE DIAMETERS.

Males,	7.3 inches:	9.9 inches
Females,	6.6 inches:	8.9 inches
Both sexes,	6.9 inches:	9.4 inches

MEASUREMENTS OF CHEST—Continued.

Circumference, in Full Inspiration.	Males.	Females.	Total.
21 inches,	1	17	18
25 inches,	1	44	45
26 inches,	3	160	163
27 inches,	26	357	383
28 inches,	80	511	591
29 inches,	160	536	696
30 inches,	368	553	921
31 inches,	480	361	841
32 inches,	607	252	859
33 inches,	496	124	620
34 inches,	394	75	469
35 inches,	270	47	317
36 inches,	157	33	190
37 inches,	78	14	92
38 inches,	33	10	43
39 inches,	13	5	18
40 inches,	6	3	9
41 inches,	4	1	5
42 inches,	1	0	1
43 inches,	1	0	1
Not stated,	379	281	660

Average circumference, males, 32.2 inches.
Average circumference, females, 32 inches.
Average cricumference, both sexes, 32.1 inches.

Circumference, in Full Inspiration.	Males.	Females.	Total.
25 inches,	0	7	7
26 inches,	1	15	16
27 inches,	1	45	46
28 inches,	8	199	207
29 inches,	22	341	363
30 inches,	77	515	592
31 inches,	173	554	727
32 inches,	323	534	857
33 inches,	490	338	828
34 inches,	581	230	811
35 inches,	562	144	706
36 inches,	326	74	400
37 inches,	285	45	330
38 inches,	185	31	216
39 inches,	78	12	90
40 inches,	36	12	48
41 inches,	19	1	20
42 inches,	6	6	12
43 inches,	3	0	3
44 inches,	2	0	2
45 inches,	1	0	1
Not stated,	379	281	660

Average circumference, males, 34.5 inches.
Average circumference, females, 31.4 inches.
Avreage circumference, both sexes, 32.8 inches.

PATIENTS DROPPED FROM ROLL DURING YEAR
Jan. 1, 1911 TO DEC. 31, 1911.

Reason and Condition.	Patients admitted during 1911.		Patients admitted prior to 1911.		
	Males.	Females.	Males.	Females.	Total.
Arrested,	61	78	235	341	715
Died from tuberculosis,	288	185	275	247	995
Died from other causes,	9	3	2	3	17
One visit only,	134	89	39	50	312
Moved away:					
Improved,	173	176	313	411	1,073
Unimproved,	107	125	149	153	534
Unchanged,	43	22	1	3	69
Voluntary non-attendance:					
Improved,	252	242	402	496	1,392
Unimproved,	222	178	174	284	858
Unchanged,	72	51	2	48	173
Sent to the sanatorium:					
Improved,	345	195	110	87	737
Unimproved,	450	264	114	105	933
Unchanged,	245	180	21	14	460
Referred to family physician:					
Improved,	34	52	38	66	190
Unimproved,	50	48	28	32	158
Unchanged,	18	22	0	1	41
Disobedience:					
Improved,	27	7	36	27	97
Unimproved,	27	11	27	31	96
Unchanged,	3	2	4	1	10
Reason not stated:					
Improved,	11	1	12	13	37
Unimproved,	32	4	5	2	43
Unchanged,	23	2	8	0	33

LENGTH OF TIME UNDER TREATMENT OF PATIENTS ADMITTED AND DROPPED DURING THE YEAR 1911.

Time.	Males.	Females.	Total.
Less than 1 month,	516	318	834
1-2 months,	567	377	944
2-3 months,	458	297	755
3-4 months,	310	233	543
4-5 months,	227	186	413
5-6 months,	185	172	357
6-7 months,	189	120	309
7-8 months,	74	114	188
8-9 months,	52	50	102
9-10 months,	21	28	49
10-11 months,	17	24	41
11-12 months,	10	18	28

Average length of time under treatment—males, 3.8 months.
Average length of time under treatment—females, 3.5 months.
Average length of time under treatment—both sexes, 3.6 months.

LENGTH OF TIME UNDER TREATMENT OF PATIENTS ADMITTED PRIOR TO YEAR 1911 AND DROPPED DURING 1911.

Time.	Males.	Females.	Total.
Less than 1 month,	10	0	10
1-2 months,	83	52	135
2-3 months,	63	55	118
3-4 months,	99	79	178
4-5 months,	113	97	210
5-6 months,	120	117	237
6-7 months,	97	108	205
7-8 months,	114	106	220
8-9 months,	114	101	215
9-10 months,	66	102	168
10-11 months,	72	104	176
11-12 months,	111	156	267
12-24 months,	727	944	1,671
Over 24 months,	206	394	600

Average length of time under treatment—males, 13.16 months.
Average length of time under treatment—females, 15.12 months.
Average length of time under treatment—both sexes, 14.14 months.

TABULATION OF LUNG LESIONS.

Number of patients examined,	9,151	......
Lesion in right upper lobe only,	2,020	22 %
Lesion in left upper lobe only,	536	5.8%
Lesion in two lobes only,	3,813	41.7%
Lesion in more than two lobes,	1,998	21.8%
Lesion in right lower lobe only,	27	......
Lesions in right middle lobe only,	53	......
Lesions in left lower lobe only,	57	......
Lesions in right lung only,	2,376	26 %
Lesion in left lung only,	740	8 %
Lesions in both lungs,	5,195	56.8%
Site of lesion not given,	104	......
Site of lesion non-pulmonary,	228	......

RECAPITULATION OF TUBERCULOSIS PATIENTS ADMITTED AND DISCHARGED IN STATE TUBERCULOSIS DISPENSARIES.

No. of patients admitted prior to the year 1911,	30,934	
No. of patients admitted during the year 1911,	9,157	
		40,091
No. of patients discharged prior to the year 1911,	22,599	
No. of patients discharged during the year 1911,	8,973	
		31,572
No. of patients remaining under treatment December 31, 1911,..		8,519

REPORT OF THE TUBERCULOSIS EXHIBIT.

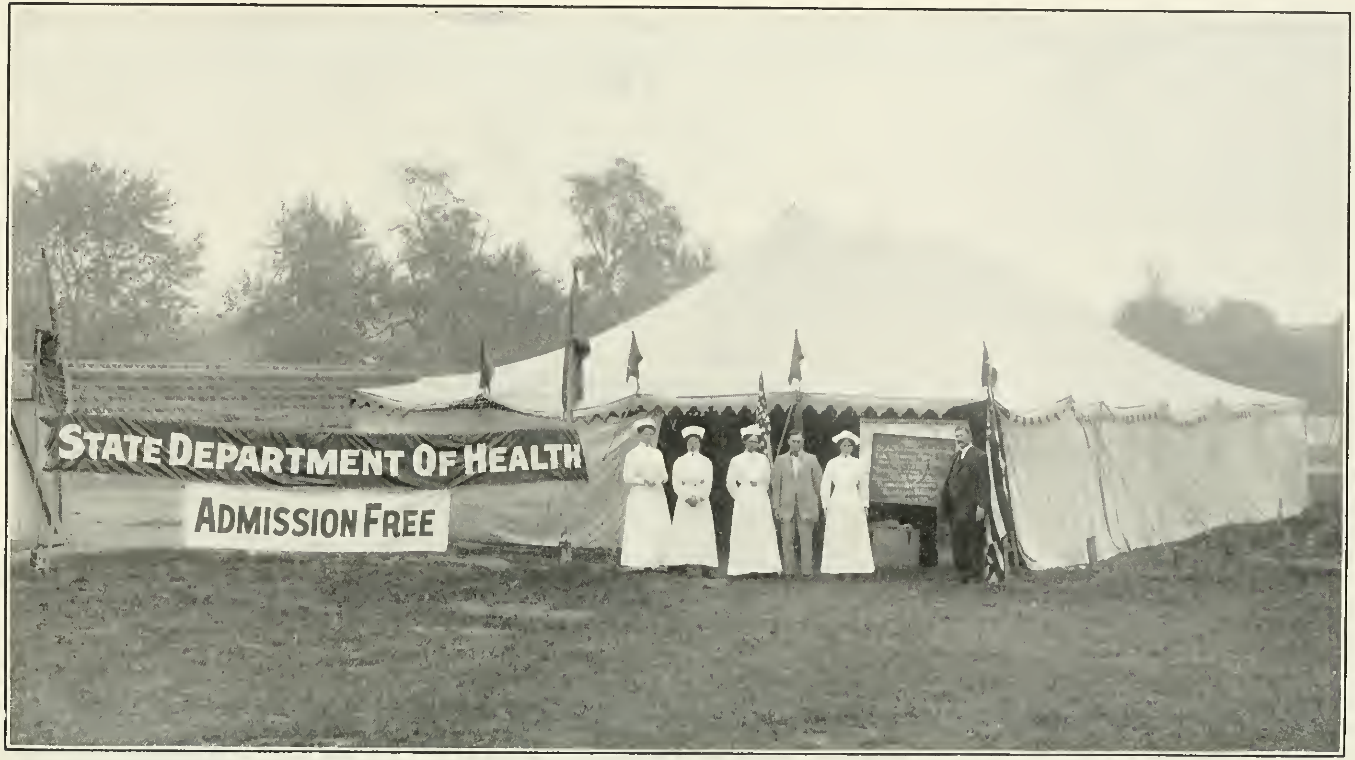
William C. Miller, M. D., Lecturer and Manager.

The Tuberculosis Exhibit, the purpose of which was to illustrate the methods adopted by the Department of Health, in its warfare against Tuberculosis and to disseminate information concerning the cause, prevention and cure of the disease, was shown at Philadelphia in January and later in the Armory at State College, where it remained on view from July 3rd until July 8th inclusive. During that time it was visited by 400 persons. An illustrated lecture given in the College Chapel July 5th was attended by 350 persons. The exhibit was then placed under a special manager for demonstration in other parts of Pennsylvania.

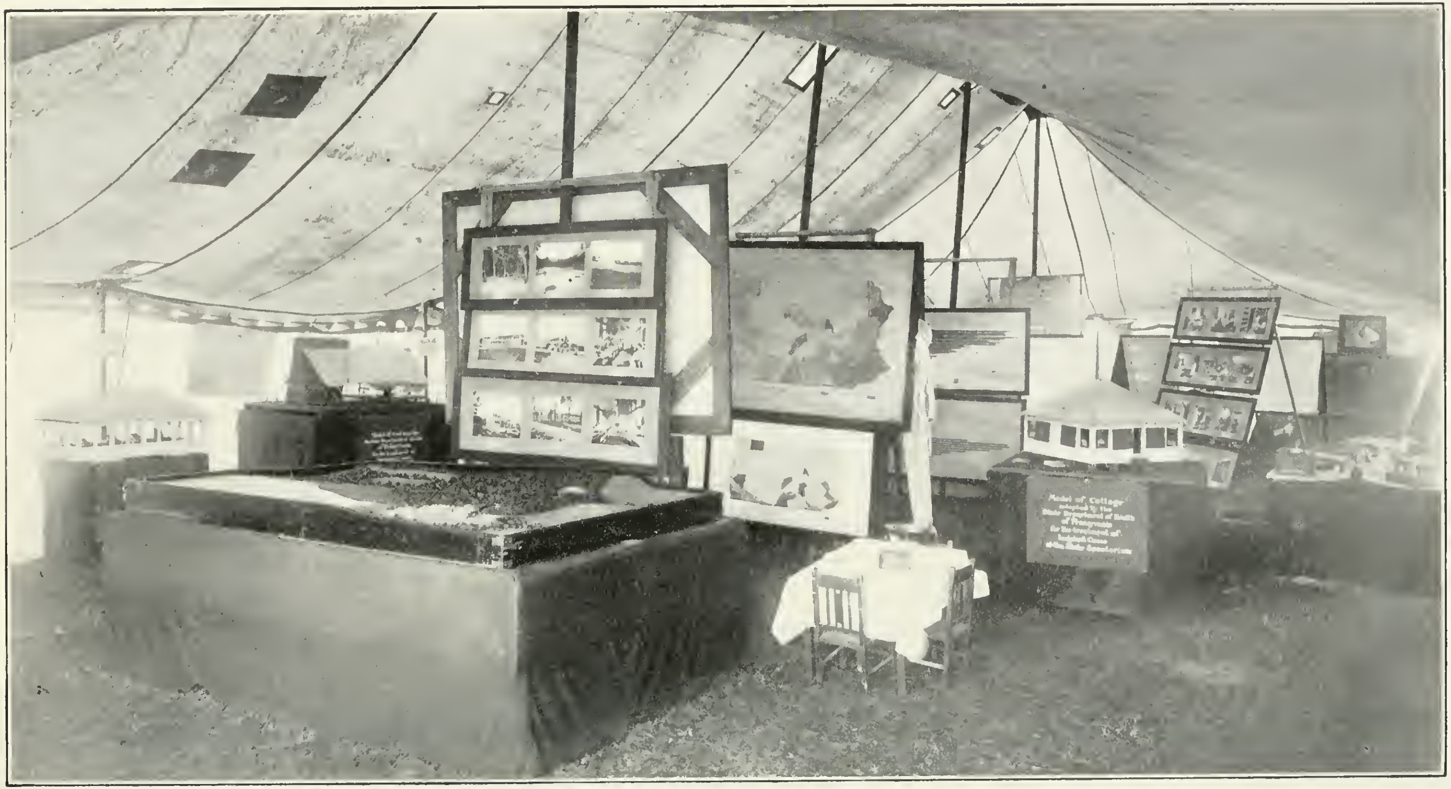
A number of new features had been added and it now consisted of models showing the topography of the State Sanatorium at Mont Alto, the style of construction of the cottages, pavilions and various other buildings at that Institution; and numerous maps and charts setting forth the prevalence of Tuberculosis in the different counties of Pennsylvania, comparative death rates of different diseases, the location of the 115 free State Tuberculosis Dispensaries and the other two Sanatoria, together with valuable statistical information compiled from reports of the different divisions of the Department of Health.

In the Dispensary outfit were displayed the different instruments and appliances used in the examination of patients, as well as the paper sputum cups, napkins and other supplies furnished them. A feature of special interest was the exhibit of the Division of Laboratories, where could be seen the apparatus used in the Department Laboratory in the examination of water, the analysis of urine, the Widal test for typhoid fever, the examination of sputum and pathological specimens, and methods used in other important work accomplished in this Division. By the aid of a suitable microscope and a large collection of slides the tubercle bacillus and different pathological conditions were demonstrated to visitors.

In one part of the large photographic display good and bad living conditions were accentuated by contrast. Another demonstrated the methods adopted by the Department and followed in the Dispensaries in the examination of patients. A series of scenes from Mont Alto gave a general idea of the daily routine and mode of living at the State Sanatorium.



The Tent of the Department of Health for the Installation of the Tuberculosis Exhibit at Country Fairs.



The Tent Show from the Inside.

The different parts of the exhibit were prepared with the view to being economically packed for transportation. Many of the packing boxes, fitted with legs and provided with neat covers, served as stands for the models and set pieces. The Exhibit was under the charge of a Manager, who was aided by one male assistant and one or more nurses.

At each place visited, literature consisting of circulars and bulletins issued by the Department of Health were distributed. Illustrated lectures were held for the general public. Special attention was given to the Public Schools and wherever possible in addition to lectures which were held at the schools, an effort was made to have the pupils visit the exhibit.

From July 3rd until December 31, 1911 the following places were visited by the exhibit in the order named:

State College, Greensburg, Latrobe, Harrisburg, Johnstown, Patton, Ebensburg, Indiana, Punxsutawney, Kittanning.

From July 3rd, 1911 to December 31st, 1911, the Exhibit was viewed by 25,000 persons. Fifty-two lectures were given at which there was an attendance of eleven thousand.

⁂

Report of the Laboratories,

COMPILED BY

J. B. RUCKER, JR., M. D., *Bacteriologist.*

REPORT OF THE LABORATORIES.

The routine work of the laboratory during the year has shown nearly the same number of specimens examined as during the year 1910, notwithstanding the fact that about the middle of May the laboratory moved its belongings from the Medical Department of the University of Pennsylvania and settled itself in new quarters in a large 14 room building at the S. W. Cor. of 20th and Arch Sts., Philadelphia, which has been fitted up for the use of the division. During the last seven months of the year a great many changes and improvements necessarily had to be made in the interior of the building, such as electric wiring, plumbing, carpentry, painting, etc., which at times caused the laboratory workers great inconvenience. During the latter part of November and throughout December the Laboratory from top to bottom was given three coats of flat paint of a buff color and a finishing coat of shellac on the ceilings and walls. All floors and woodwork were also given several coats of paint. Yet under all these trying conditions, the routine examinations were made and the staff was able also to do considerable research work.

The methods of handling and reporting on examinations of specimens has been the same in general as that outlined in previous reports.

Many changes in the laboratory staff occurred during the year. On July 1st, 1911, Dr. Herbert Fox, who had been Chief of the Laboratories since its organization, resigned his position as Chief of the Laboratories and the Commissioner appointed Dr. D. H. Bergey, Assistant Professor of Bacteriology of the University of Penna., to fill the position temporarily from July 1st to October 1st, 1911.

On October 1st, Dr. S. H. Gilliland, was appointed by the Commissioner to take the position as Chief temporarily held by Dr. Bergey

During the month of June Miss Lucy H. Irwin, stock clerk, resigned and Mrs. Mary Andress succeeded to her position, while the position made vacant by the promotion of Mrs. Andress was filled by Miss Amy E. Engelbert in July. Miss Helen M. O'Donnell, chief stenographer, resigned in February, 1911. Miss Marie Stella Krause was appointed in her place, and the position of second stenographer was filled by the appointment of Miss Estelle L. Hecht.

Mr. H. L. MacAskie, Technical Assistant, resigned in September and Dr. J. M. Campbell was appointed October 1st to fill that position and to make the histological examination of new growths and other pathological tissues, as an aid to diagnosis, which had previously been done by the Chief of the Laboratories, Dr. Fox.

William Kingston left the service of the laboratory as shipper and laboratory watchman and Lewis Brown was appointed to succeed him in September.

Timothy Quinlan, in charge of the experimental stables of the Department of Health, at Bryn Mawr, relinquished his position in November as a consequence of the discontinuation of the experimental station.

Following are the records of the number and character of specimens examined in the laboratory during the year 1911. The total number of examinations was 236 less than the total number for last year.

SPECIMENS EXAMINED IN THE LABORATORIES DURING THE YEAR 1911.

	A	B	C	D	E	F	G	H	J	K	Total.
January, ...	4	36	578	23	13	32	2	256	4	14	962
February, ...	2	32	600	23	11	23	0	812	8	11	1,522
March, ...	1	75	646	34	10	30	1	781	23	11	1,612
April, ...	0	43	578	11	12	14	0	433	1	5	1,097
May, ...	1	38	623	15	16	19	0	319	5	6	1,042
June, ...	5	56	487	12	9	26	0	280	6	5	886
July, ...	4	71	461	16	7	24	0	766	7	30	1,386
August, ...	3	115	475	19	15	34	12	893	8	19	1,593
September, ...	5	90	359	8	11	19	14	904	8	28	1,446
October, ...	4	120	429	13	9	8	4	928	9	7	1,531
November, ...	5	55	403	14	6	22	0	625	4	32	1,166
December, ...	3	63	482	12	9	32	0	545	13	16	1,175
Total, ...	37	794	6,121	200	128	283	33	7,542	96	184	15,418

A. Malaria.
B. Typhoid.
C. Sputum.
D. Urine.
E. Pathological Fluids
F. Pathological Growths.
G. Milk.
H. Water.
J. Feces.
K. Miscellaneous.

Malaria. 37 specimens of blood were examined for the malarial parasite, 13 less than last year. Of these, 5 showed the presence of the plasmodium while in 32 their presence was not noted. One specimen sent in was unfit for examination.

Widal test for typhoid fever. 209 more specimens of blood for this test were handled this year than last. 325 gave a positive reaction. 382 were negative while 87 were unfit for examination. Of the positives 180 specimens were taken from males and 145 from females. The negative reaction included 216 males, 166 females. The percentage relation of positive reactions to the whole number of examinations was therefore 46.

The test is now made almost entirely with serum collected in the small glass bulbs contained in the outfit sent out by the Department for such examinations.

Sputum, for tubercle bacilli. Number of specimens coming into the laboratory this year showed a falling off of 1,485 over that of the year 1910. In 1,373 specimens tubercle bacilli were present. They were not found in 4.569 specimens. 179 specimens were unfit for examination. In 23.1 per cent. of the specimens tubercle bacilli were found.

Urine. During 1911 200 specimens were examined, 66 less than during the previous year. Of these 135 came from the two Philadelphia Tuberculosis Dispensaries maintained by the Pennsylvania Department of Health. By a special permit from Dr. Dixon a routine chemical examination of these was made. Nine diazos, 25 general bacteriological, and 31 examinations for tubercle bacilli were made. In three of the examinations for tubercle bacilli the organisms searched for were found.

Fluid Exudates. The number of examinations of this character was 128, the same as for 1911.

Tubercle bacilli were sought for 58 times and were found 11 times. There were 55 examinations for the gonococcus; its presence was noted in 19 of these.

Examination was made for the Oppler-Boas bacillus in 6 cases of suspected gastric carcinoma. The general bacteriological examinations numbered 9.

Pathological Growths. These exceeded the number reported upon in 1910 by 93. Of the total number (283), 150 were for tumor diagnosis; 56 for examination as to the presence of tubercle bacilli, wherein the organisms were present 9 times. Other examinations of tissues numbered 77.

Milk. Only 33 examinations of milk were made during the year. Most of these were in the month of August and September when diarrhoeal diseases were prevalent. They were examined for colon bacilli, streptococci and general bacteriological content. Following is a tabulation of the number of samples by places and counties, as to source:

MILK LIST.

ARMSTRONG COUNTY	
Parkers Landing,	1
BERKS COUNTY	
Shoemakersville,	2
BUCKS COUNTY	
Sellersville,	4
W. Rockhill Township,	2
CAMBRIA COUNTY	
Johnstown,	19
HUNTINGDON COUNTY	
Huntingdon,	1
INDIANA COUNTY	
Indiana,	2
Penn Run,	1
LYCOMING COUNTY	
Halls,	1

Water. There were 7,541 samples of water examined this year as against 5,624 in 1910. In these examinations a count of the number of colonies of colon bacilli and of the bacterial colonies in toto per c. c. were made as in former years.

The listing of the samples examined is here given according to counties wherein their sources of collection lay.

WATER LIST.

ADAMS COUNTY	
Abbottstown,	6
East Berlin,	11
Fairfield,	2
Gettysburg,	7
Littlestown,	3
New Oxford,	28
ALLEGHENY COUNTY	
Allison Park,	4
Coraopolis,	6
Glassport,	6
McKees Rocks,	2
Millvale,	35
Sewickley,	21
Tarentum,	22
Whitaker,	3
ARMSTRONG COUNTY	
Boggs Township,	1
Dayton,	1
Freeport,	6
Kittanning,	24
Madison Township,	4
Parkers Landing,	94
Worthington,	6
BEAVER COUNTY	
Koppel,	4
BEDFORD COUNTY	
Bedford,	12
Hyndman,	6
Piney Creek Township,	5
Woodbury,	3
BERKS COUNTY	
Bally,	6
Bernville,	4
Birdsboro,	2
Blandon,	17
Centerport,	3
Geigertown Station,	1
Hamburg,	8
Joanna Heights,	6
Lenhartsville,	1
Maxatawney,	1
Elin,	6
Reading,	6
Shoemakersville,	11
Spring Township,	3
Wernersville,	109
BLAIR COUNTY	
Altoona,	12
Bald Eagle,	4
Williamsburg,	6
BRADFORD COUNTY	
Athens,	5
Burlington,	1
Camptown,	9
Canton,	8
Le Raysville,	1
Litchfield,	1
N. Orwell,	5
Quarry,	2
S. Towanda,	4
Wyalusing,	7

BUCKS COUNTY	
Bristol,	6
Fallsington,	2
Hartsville,	4
Ivyland,	8
Ottsville,	6
Perkasie,	12
Plumsteadville,	18
Quakertown,	6
Rich Hill,	1
Sellersville,	10
W. Rockhill Township,	3
BUTLER COUNTY	
Portersville,	6
Slippery Rock,	16
Zelienople,	4
CAMBRIA COUNTY	
Cresson,	6
Dale,	1
Ebensburg,	18
Johnstown,	66
Loretto,	2
Patton,	151
Summit,	4
CENTRE COUNTY	
Bellefonte,	4
Fleming,	5
Hublersburg,	2
Lemont,	4
CHESTER COUNTY	
Berwyn,	3
Chester Springs,	8
Devon,	250
Kennett Square,	5
Oxford,	6
Parkersburg,	2
Phoenixville,	60
Spring City,	173
W. Pikeland,	2
CLARION COUNTY	
Hawthorne,	14
New Bethlehem,	11
St. Petersburg,	5
CLEARFIELD COUNTY	
Burnside,	3
DuBois,	2
Lumber City,	3
Rockton,	2
Woodland,	4
COLUMBIA COUNTY	
Benton,	21
Berwick,	18
Bloomsburg,	69
Locust Township,	3
CRAWFORD COUNTY	
Adamsville,	3
Cambridge Springs,	6
Cochranton,	1
Geneva,	2
Meadville,	1
Saegerstown,	4

WATER LIST—Continued.

CUMBERLAND COUNTY

Bowmansdale,	1
Camp Hill,	6
Carlisle,	4
Mechanicsburg,	5

DAUPHIN COUNTY

Dauphin,	5
Fox Chase,	6
Harrisburg,	12
Hershey,	96
Middletown,	10
Penbrooke,	6
Swatara Township,	1

DELAWARE COUNTY

Lenni,	3
Manoa,	18

ELK COUNTY

Laurel Mill,	1
Ridgway,	8

ERIE COUNTY

Edinboro,	11
Erie,	2,069
Girard,	1
W. Springfield,	1

FAYETTE COUNTY

Connellsville,	43
Dunbar,	6
Fairchance,	2
Martin,	12
Mt. Braddock,	4
Trotter Water Co.,	7
Uniontown,	107
Vanderbilt,	1

FRANKLIN COUNTY

Chambersburg,	20
Fannettsburg,	5
Greencastle,	4
Mercersburg,	9
Mont Alto,	185
Waynesboro.	6

FULTON COUNTY

McConnellsburg,	6
New Grenada,	2

GREENE COUNTY

Mt. Morris,	1
Rices Landing,	5

HUNTINGDON COUNTY

Huntingdon,	5
Mapleton,	2
Petersburg,	1
Shade Gap,	5
Spruce Creek,	2
Warriors Mark,	6

INDIANA COUNTY

Black Lick,	1
Dixonville,	1
Indiana,	32
Iselin,	17
Penn Run,	11
Saltsburg,	2
Smicksburg,	6

JEFFERSON COUNTY

Brookville,	16
Coolspring,	2
Corsica,	6
Knox Dale,	2

LACKAWANNA COUNTY

Clarks Summit,	2
Elmhust,	5
S. Waverly,	9
Waverly,	3

LANCASTER COUNTY

Akron	5
Cambridge,	5
Christiana,	9
Elizabethtown,	14
Ephrata,	74
Florin,	12
Lancaster,	40
Landisville,	2
Leola,	4
McCall Ferry,	6
Manheim,	15
Quarryville,	2
Springgrove,	14
Strasburg,	2

LAWRENCE COUNTY

New Wilmington,	6

LEBANON COUNTY

Annville,	8
Jonestown,	1
Mt. Gretna,	367
Myerstown,	4
Pine Grove,	11
S. Lebanon Township,	1

LEHIGH COUNTY

Allentown,	1
Coopersburg,	4
East Texas,	1
Emaus,	11
Jacksonville,	1
Shimerville,	1
Vera Cruz,	2

LUZERNE COUNTY

Larksville,	5
Luzerne,	10
Nescopeck,	7
White Haven,	79

LYCOMING COUNTY

Halls,	2
Hughesville,	1
Jersey Shore,	10
Montgomery,	59
Muncy,	16
Salladasburg,	1
Warrensville,	4

McKEAN COUNTY

Bradford,	4
Port Allegany,	6

MERCER COUNTY

Mercer,	2
Sharon,	1

MIFFLIN COUNTY

Lewistown,	3
Newton Hamilton,	12
Reedsville,	1

WATER LIST—Continued.

MONTGOMERY COUNTY	
Ambler,	1
Elkins Park,	3
Glenside,	3
Jenkintown,	6
Lansdale,	14
Norristown,	105
North Wales,	6
Penllyn,	2
Pennsburg,	4
Pottstown,	9
Red Hill,	1
Springfield Township,	5
Telford,	1
Trappe,	4
Upper Providence,	4
W. Conshohocken,	6
Willow Grove,	36
Wyncote,	6
MONTOUR COUNTY	
Danville,	277
NORTHAMPTON COUNTY	
Bethlehem and S. Bethlehem,	844
Easton,	1
Wind Gap,	5
NORTHUMBERLAND COUNTY	
Dalmatia,	1
Northumberland,	6
Shamokin,	18
Sunbury,	6
Trevorton,	23
Turbotville,	3
PERRY COUNTY	
Mannsville,	2
Marysville,	12
New Bloomfield,	2
Newport,	6
PHILADELPHIA COUNTY	
Roxborough,	5
PIKE COUNTY	
Bushkill,	5
POTTER COUNTY	
Austin,	171
Costello,	12
Sunderlinville,	1
SCHUYLKILL COUNTY	
New Ringgold,	2
Tower City,	6
Tremont,	5
SNYDER COUNTY	
Selinsgrove,	5
SOMERSET COUNTY	
Acosta,	5
Ashtola,	4
Boswell,	5
Casselman,	5
Frieden,	3
Markleton,	1
Shanksville,	6
Somerset,	7
Windber,	8
SUSQUEHANNA COUNTY	
Dimock,	2
TIOGA COUNTY	
Elkland,	17
Leetonia,	2
Nelson,	4
Richmond Township,	2
Wellsboro,	1
UNION COUNTY	
Mifflinburg,	2
W. Buffalo,	1
VENANGO COUNTY	
Oil City,	24
Polk,	161
WARREN COUNTY	
Deerfield,	1
WASHINGTON COUNTY	
Amity,	4
Charleroi,	5
Houston,	2
Marianna,	127
Monongahela,	25
Washington,	27
WAYNE COUNTY	
Ariel,	1
WESTMORELAND COUNTY	
Derry,	5
Herminie,	1
Latrobe,	12
Monessen,	8
Mt. Pleasant,	8
Ruffsdale,	5
Scottdale,	14
Trafford,	2
Youngstown,	13
WYOMING COUNTY	
Vernon Township,	1
YORK COUNTY	
Dallastown,	9
Dillsburg,	3
Felton,	5
Glen Rock,	12
Hanover,	17
Heidelberg,	4
Jefferson Boro,	1
New Freedom,	2
Parke,	1
Stewartstown,	3
York,	21

Feces. Number examined 96 (39 more than in 1910). 28 were examined for tubercle bacilli with positive results in two cases. A general bacteriological examination was made of 55 specimens. Three were discarded as unfit for examination.

Miscellaneous. There were 184 of these specimens. 158 of them were for suspected diphtheria, 95 of these showing the presence of the Klebs-Loeffler bacillus.

There were 21 examinations of specimens which required a general bacteriological examination.

Five specimens were received unfit for examination.

RESEARCH WORK OF THE LABORATORY.

I. Effect of Injections of Taurin, Urea and Lecithin on Tumors of the Alveolar Sarcoma Type in Dogs. Dr. Dixon, Dr. Fox.

II. Experiments on the Injection of Human Tubercle Bacilli into Cows. Dr. Dixon, Dr. Fox.

III. Viability of the Tubercle Bacillus in Sewage, Tap, and Distilled Waters. Dr. Dixon, Dr. Fox, Dr. Rucker.

IV. Experimental Work on Poliomyelitis. Dr. Dixon, Dr. Rucker.

V. On the Occurrence of the Tubercle Bacillus in the Urine of Tuberculous Patients. Dr. Dixon, Dr. Rucker.

VI. Experiments on the Etiology of Scarlet Fever. Dr. Bergey.

VII. Experiment to Demonstrate the Colon Bacilli and Acid-fast Organisms of Tubercle Bacillus Morphology on Fruits. Mr. A. Garcia.

I. ON THE EFFECT OF INJECTIONS OF TAURIN, UREA, AND LECITHIN ON CERTAIN TUMORS.

At the completion of the experiments on dog and mouse tumors, with taurin, Dr. Dixon directed the continuation of experiments on dog tumors with taurin, lecithin and urea. Five dogs were inoculated with a piece of original strain. They were treated with the compounds above mentioned, as indicated in the notes on Dog No. 13. It will be noticed in reading the experimental notes, that the dogs receiving taurin had progressively growing tumors, while in those receiving lecithin tumors had retrogressed or remained dormant. The tumors in dogs receiving urea tended to increase slowly. The experiments showing no marked retardation of the growth of the tumors by the injection of the chemicals, the injections were stopped, and later Nos. 15 and 19 (extra control dog) were given one gram of urea and one gram of lecithin, respectively. These have been continued twice weekly from the 19th of June.

Dog No. 1.—This dog was operated on March 18, 1911, and the entire pectoral tumor, 60x50 mm., was removed; and from it dogs No. 18 and No. 19 were inoculated. Dog No. 18 was killed a few days later because of distemper.

Dog No. 10.—This dog was also operated on March 18, 1911, and from the piece of pectoral tumor removed dogs No. 13, 14, 15, 16, and 17 were inoculated. Dog No. 16 was killed a few days later because of distemper.

Dogs No. 1 and 10.—These dogs received 19 injections of concentrated taurin beginning April 3, 1911. They were injected every other day until May 26, 1911, when injections ceased. Both No. 1 and No. 10 and their control (No. 19) showed tumors steadily growing.

Dog No. 13.—This dog received 13 injections of urea. The first injection was on April 19, 1911, with 100 mg. The second was with 200 mg., then 500 mg., then 700 mg., then 1 gm. on April 26, 1911. From this point on it received 1 gm. twice a week. On May 26 the injections ceased. The tumors were about the same in size as when the injections began. On April 3, they were 30 x 15 mm and 20 x 15 mm. On April 3, 1911, the measurements of this tumor were 20 x 30 mm. Killed September 19, 1911, on account of injury to leg received in a fight with another dog.

Dog No. 14.—This dog was injected with lecithin on ten different occasions April 17 to May 10, 1911, inc., in same manner as No. 13 received urea. The tumor retrogressed.

Dog No. 15.—Taurin injected in same dosage as above for 12 doses from April 17 to May 15, 1911 inc. Tumors grew. First measurements 40 x 30—15 x 20 mm.

Dr. Dixon directed that dog No. 15, female, brown and white spaniel, formerly injected with taurin, be injected with 1 gm. urea in 5 c. c. sterile water twice (Monday and Friday) a week. Seven injections given, beginning June 19 and ending July 10, 1911, because of inflammation. The tumors increased steadily in size. Killed by administration of KCN November 2, 1911.

Dog No. 19.—Female, brown mongrel, formerly control for Dog. No. 1, had been injected with taurin with no results. Was then injected with 1 gm. egg lecithin in 10 c.c. sterile water twice (Monday and Friday) a week. Seven injections given from June 19 to July 10, 1911, then stopped because of inflammation which developed into ulceration at site of injection. Tumor extended across the body when injections of lecithin were begun. After injections ceased, tumor was of practically same size as when they began.

The object of the experiment was to demonstrate the effect of the substance mentioned upon the growth of the tumor, which was an alveolar round cell sarcoma of the dog lympho-sarcoma type.

Dog No. 17.—No injections of any kind given. Served merely as control. The tumors slowly but steadily increased in size from the time of implantation.

Dog No. 1.—November 2, 1911.—Last measurement of pectoral tumor was 71.5 x 61 mm; inguinal tumor 56.1 x 53 mm.

Dog No. 10.—Killed with KCN November 2, 1911.

Nodulated tumor on abdominal wall, post. to xyphoid cartilage, extending on each side of the median line. Nodulation is quite marked. The mass measured 175 mm long by a varying width of 12.5 to 50 mm. One of the nodules is entirely separated from the main tumor except for a slight connection by means of small bands of connective tissue. On the left chest wall posterior to scapula there is a small round tumor 12.5 mm in diameter. This may have been a metastatic growth from the main pectoral tumor.

Dog No. 15.—Killed November 2, 1911, KCN.

This animal had three tumors, one on the abdominal wall to the left of median line, size 6.3 x 10 cm., the other two on each side of thoracic cavity. The one on the left side, size 6.3 x 5 cm. The one on the right side 2.5 x 1.9 cm. No metastasis. Sections taken from all.

Dog No. 17.—Killed with KCN November 2, 1911.

Two tumors on each side of chest wall. The one on the right side measured 10 x 7.6, that on the left side 15 x 10 cm. This tumor extended for 2.5 cm. beyond the median line upward and backward on the left side measuring 19 x 10 cm. The lower portion over median line 6.3 x 6.3 cm. was broken down, ulcerating and presented a dirty gray appearance. The tumors were neither adherent to the skin nor to the muscular wall. They presented a nodular appearance and on section the nodules appeared grayish white, soft and of the consistency of fatty tissue. A careful post mortem examination revealed no metastasis. Right brachial gland saved.

Dog No. 1.—Small round cell sarcoma of the alveolar type. Fibrous tissue rather abundant. Nuclei well stained and vesicular. Many blood vessels in sections, the walls of which are encroached upon by the tumor cells. Some sections show haemorrhage into tumor tissue. A few sections show a degenerated central mass of detritus. There seems to have been some attempt at encapsulation or resolution because of the great amount of fibrous tissue present in many of the sections. Young spindle cells are seen pushing out into the tumor tissue from every side.

Dog No. 10.—*Chest wall:* Small round cell sarcoma. Abundance of connective tissue. Nuclei not well stained. Much new connective tissue is seen.

Main Tumor: Small round cell sarcoma—alveolar; great amount of loose fibrous tissue scattered throughout. Very few blood vessels in tissue.

Dog No. 15.—*Tumor from left thoracic wall.* Small round cell aveolar sarcoma. Abundance of loose connective tissue among tumor cells. Areas of necrosis in which nuclei do not stain and the cells themselves in this area are jumbled together. Attempt at resolution of tumor into connective tissue is marked. Very few blood vessels seen.

Tumor on right thoracic wall. Same as above except that fibrosis is even more marked.

Main abdominal tumor. Small round cell aveolar sarcoma. Tumor cells less compact. Connective tissue abundant. Fibrosis marked. Few blood vessels.

Dog No. 17.—Small round cell alveolar sarcoma. Blood vessels plentiful. Rather abundant connective tissue.

II. EXPERIMENTS ON THE INJECTION OF HUMAN TUBERCLE BACILLI INTO COWS.

This is a continuation of the experiment started in 1909, continued in 1910, and finally concluded in 1911. Its objcet was to demonstrate: first, the excretion of human tubercle bacilli in the milk; second, the immunity produced by the intravenous injection of the human type of organism toward an infection by the bovine type; and third, to determine any possible mutation in morphology or virulence of the organism recovered from the cows.

The injections were made into the jugular vein. The result of the experiment up to the end of 1910 is found in the Report of the Commissioner of Health for the years 1909 and 1910.

Referring to the 1909 report, we find that tubercle bacilli could not be demonstrated in the milk of healthy cows before injection of the organisms. After injection, however, of 12 milligrams of human tubercle bacilli, organisms of the acid-fast bacillary type were found in the milk up to and including the 17th day after injection. The number was much greater on the second day than on the first day after injection, and, from that time on, gradually decreased.

In the report for 1910 the statement was made, as a result of experiments with two cows, that tubercle bacilli may be excreted in the milk for at least 67 days after injection into the circulation.

The technique for milk examinations, as well as that used for examination of urine and feces for tubercle bacilli, may be found in the 1909 report.

The last injection of the three remaining cows, viz. No. 15, No. 16 and No. 17, during the year 1910 was made on November 30th, this being the sixth injection, consisting of 10 milligrams of 2-F culture, and received by each of them.

In preparation for the 7th injection—milk taken from all three cows—January 23, 1911.

Cow No. 15	About 5 organisms in first ½ hour of examination.
Cow No. 16	0
Cow No. 17	0

2-16-11. Injected all three cows. 14 mg. emulsion Human 2-F into jugular. No control—all material used. Was pure under microscope.

Tubercle bacilli or acid fasts have been found so regularly in milk of Cow No. 15 that the milk taken on second day of this test will be injected into inguinal region of Guinea pig. All cows so tested. This is to see if we have a human type of tubercle bacilli from the milk or a natural bovine infection. Culture to be isolated.

MILK—DIRECT EXAMINATION:

	DAY		
	Second	Sixth	Eighth
Cow No. 15.	Slide unfit	I clump in 1 hour	I clump in 1 hour
Cow No. 16.	0	0	0
Cow No. 17.	Slide unfit	2	1

Cow No. 15.	Guinea Pig 1179 1180	In making this test one-half of sediment used for slide (direct examination) the other half equally divided for injection. All dead from peritonitis next day.
Cow No. 16.	Guinea Pig 1178 1177	
Cow No. 17.	Guinea Pig 1175 1176	

As all the pigs injected with the sediment of milk taken 2-16 died almost immediately (probably from foulness of the milk), 6 more were injected on 2-21, i. e. 6 days after injection of cows.

	Guinea Pig		
Cow No. 15.	1185	Died 3-10-11.	Pneumonia.
	1186	Died 2-29-12.	Pneumonia.
Cow No. 16.	1183	Died 2-24-11.	Acute Peritonitis.
	1184	Died 2-24-11.	Acute Peritonitis.
Cow No. 17.	1181	Died 7-19-11.	General Tuberculosis.
	1182	Died 4-22-11.	Enteritis.

4-4-11. Milk collected from Cows No. 15, No. 16 and No. 17, as control before 8th injection of Tubercle Bacilli.

Cow No. 15. 0.
Cow No. 16. 0.
Cow No. 17. 1 (?).

4-11-11. Milk collected to-day as second control before 8th injection of Tubercle Bacilli.
Cow No. 15. 1.
Cow No. 16. 1.
Cow No. 17. 0.

N. B. 7th injection 2-16-11—7 months before.
4-19. Tubercle Bacilli 2-F Emulsion equalling 18 mgs. injected to-day into jugular vein of Cows.

MILK:	Cow	Stain
2nd day	No. 15	0
	No. 16	0
	No. 17	0
4th day	No. 15	0
	No. 16	0
	No. 17	0
8th day	No. 15	0
	No. 16	0
	No. 17	0

POST MORTEM NOTES.

COW NO. 16.

Killed by blow on the head and bleeding. 6-1-11.

Cow in excellent condition. None of the inguinal lymph glands, with the possible exception of the right supermammary and post mammary, show anything abnormal. These two show a very active follicular hyperplasia by which the follicular border is not increased in thickness but is densely white and firm on touch. The mammary gland is practically negative. The ampulla and the milk ducts immediately above it are slighty distended and there is only a slight stickiness and sliminess of the mucosa. The functional part of the mamma is negative, homogenous, pale gray, and practically dry. There is no tuberculosis.

Mouth and neck negative. Lymph glands small, soft and homogeneous; pale gray.

Heart is negative.

Anterior and superior mediastina contain a few small soft mottled gray lymph glands. The posterior mediastinum shows posterior aspect of tracheal glands, which are pointing backward. These glands are much enlarged, mottled yellow and gray, and contain small, yellow, precaseous tubercles. The long posterior gland is the seat of fibro-calcareo-caseous tuberculosis. The left lung is free and there is no evidence of extension from the bronchial glands above described, into the lung at the hilus. This last statement is also true for the right lung. The right lung is negative except along the anterior border of the posterior surface, where there are some adhesions to the pleura, which when traced can be followed down to the posterior septum beside the bronchial glands described above. The lung at this point shows a long strip of low grade fibro precaseous infiltrate.

Liver. The liver is slightly adherent to the diaphragm by superficial adhesions also slightly adherent to the anterior superior surface of the rumen. The parenchyma is homogeneous in consistency, slightly mottled. Centre of the lobules seem opaquely purple, interstitial tissue gray.

The kidneys are apparently normal. The spleen is apparently normal. The gastric and intestinal coats seem entirely normal. The lymph follicles of the wall are not visible. The lymphatic tissues of the abdomen are as follows:

Lesser Omentum: Except for a very active hyperplastic follicular border, negative. Retroperitoneal glands about coeliac axis negative. Mesenteric glands deeply pigmented; medullae very clear, dense yellow-white, soft, follicular boders. On the anterior superior surface of the right end of the rumen there is a sessile growth about 20 x 15 cm. x 5 cm. thick. This is nodular on the surface and attached by its capsular adhesions to a patch of thickened capsule on the inferior surface of the left lobe of the liver. On section surface of this tumor shows it to be homogeneous in consistency, with the exception of three or four small (1 cm. thin walled cysts containing a light brown fluid. The appearance of the section surface indicates a certain degree of uniformity of structure across the tumor, which is irregularly and thoroughly encapsulated. Here and there pale dense white irregular spots may be seen in contrast to the rather uniform yellow-white of the tumor.

In the coils of the long loop of the large intestine is a smaller tumor, which can be separated into two, each with its own capsule.

The section surface is precisely the same as the above minus the cysts. These tumors do not involve the walls of the stomach or intestine and seem to have originated in or on the peritoneum.

Adrenals, negative.

Mammary and supramammary glands show a mild, long-standing, round cell hyperplasia. It swells out the cords so as to obliterate most of the sinuses. Those which remain near the hilus of the gland show a slight, large lymph cell hyperplasia. At no point is there any indication of tubercle.

Right Knee Bursa: Chronic hypertrophic bursitis of right knee bursa.

Liver: A mild, passive congestion; in some places capillary congestion; and in the portal spaces, wherever the capsule of Glisson may be followed, there is a slight but definite accumulation of round cells. No evidence of compression by this interstitial increase. The parenchyma is slightly granular, probably lipoma with advanced grade of fat necrosis. The connective tissue stroma is quite scanty.

Mammary Gland: Section shows a relatively large percentage of connective tissue and muscle fibre. The glands are collapsed, not functionating, but their lining is negative. About the acini there is a low grade connective tissue cell increase and young fibro-blasts in moderate numbers.

Spleen: Aside from a moderate degree of haemosiderosis the organ is negative.

Kidney: A slight, passive congestion. Tubular epithelium well preserved, here and there slightly granular. Here and there one sees imperfectly formed hyaline casts. Throughout the section there is a slight increase of the interstitial ground and connective tissue cells. In the vicinity of the capsule of Bowman this is more noticeable and the capsule itself seems thickened and rich in cells. The capsular tuft shows increase in epithelium and connective tissue nuclei. It usually fills the capsular spaces.

Genitalia: Negative.

Test of tissues of Cow No. 16.

	G. P.	
6-1-11	1254	Inected 3⅓ c. c. bile from Cow No. 16 into peritoneal cavity.
	1255	
	1256	
6-1-11	1257	Inj. in pocket .1 loopful paste made from tumor from Cow No. 16.
	1258	
	1259	
6-1-11	1260	Inj. 2 c. c. emulsion of tuberculous mediastinal glands of Cow No. 16 into peritoneal cavity.
	1261	
	1262	

6-1-11	1263 1264 1265	Inj. 2 c. c. emulsion of tuberculous mediastinal glands of Cow No. 16, under skin.
6-1-11	1266 1267 1268	Inj. under skin with 2 c. c. emulsion of mammary gland of Cow No. 16.
6-1-11	1269 1270 1271	Inj. intraperitoneally with 2 c. c. emulsion of mammary gland of Cow No. 16.
6-1-11	1272 1274 1275	Inj. introperitoneally with 2 c.c. emulsion of lung of Cow No. 16.
6-1-11	1276 1277 1278	Inj. under skin with 2 c. c. emulsion of lung of Cow No. 16.
6-2-11	1254	Inj. intraper. 1 c. c. bile. Died pneumonia 11-23-11.
	1255	Inj. intraper. 1 c. c. bile. Died enteritis 11-24-11.
	1256	Inj. intraper. 1 c. c. bile. Died pneumonia, 11-28-11.
	1257	Inj. subcut. 1 loopful paste from tumor. Died pneumonia 3-22-12.
	1258	Inj. subcut. 1 loopful paste from tumor. Died Gen. T. B. 2-17-12.
	1259	Inj. subcut. 1 loopful paste from tumor. Died pneumonia 5-31-12.
	1260	Inj. intraper. mediastinal gland. Gen. T. B. 7-5-11.
	1261	Inj. intraper. mediastinal gland. Gen. T. B. 7-3-11.
	1262	Inj. intraper. mediastinal gland. Gen. T. B 7-6-11.
	1263	Inj. intraper. mediastinal gland. Not dead.
	1264	Inj. intraper. mediastinal gland. Gen. T. B. 7-15-11.
	1265	Inj. intraper. mediastinal gland. Gen. T. B. 8-22-11.
	1266	Inj. mammary gland—No. T. B.
	1267	Inj. mammary gland. Pneumonia 11-14-11.
	1268	Inj. mammary gland.
	1269	Inj. mammary gland. Pneumonia 11-26-11.

6-1-11 G. P.

1270	Inj. mammary gland—Not dead.
1271	Inj. mammary glandNot dead.
1272	Inj. lung—not dead.
1274	Inj. lung—not dead.
1275	Inj. lung—Gen. T. B. 9-13-11.
1276	Inj. lung—not dead.
1277	Inj. lung—Gen. T. B. 11-5-11.
1278	Inj. lung—Gen. T. B. 3-6-12.

Smears of caseous mediastinal gland stained by C. F. and decolorized by absolute alcohol, methylene blue, show a few acid fact bodies of tubercle morphology. They are not characteristic of the human form culture 2 F, which we introduced. They are beyond medium length, heavily, almost solidly stained, and with here and there granulations but no unstained places.

An hour's search over two slides made from a very thick emulsion of the nodular infiltrate in the right lung fails to show any acid fast bodies.

Smears from the cut surface of the mammary gland failed to show any acid fast bodies. Smears of bile failed to show any acid fast bodies.

The superior mediastinal glands which did not contain tubercles failed to show any acid fast forms in smears from them. Stained smears direct from the tumor and from an emulsion made from the tumor failed to show any acid fast forms.

G. P. 1260 Found dead 7-5-11. Autopsy shows enlargement of the right inguinal gland and of the mediastinal and retroperitoneal lymph gland; tuberculosis of the peritoneum, liver and spleen, as well as a number of lesions in the lung.

G. P. 1261. Found dead July 3-11. Injected June 2, 1911, with 2 c. c. emulsion of tuberculous mediastinal gland Cow No. 16, intraperitoneally. At autopsy the animal shows a marked general tuberculosis. The inguinal lymph glands are enlarged, especially the one on the right side. The peritoneum is studded with myriads of tubercles and the liver and spleen are involved in a very generalized tuberculosis. A few tubercles are seen in the lung. The mediastinal and the retro-peritoneal lymph glands also appear to be tuberculous.

G. P. 1278. Liver: Areas of necrosis are seen throughout section. There are bands and areas of epithelial cell proliferation, which seem to originate from the bile duct epithelium. These areas are so thick and so numerous that they have completely overgrown the liver cells, and give the appearance of a malignant epithelioma. No tubercles or tubercle bacilli were found. Fibrous tissue overgrowth is marked.

Lung: Almost solid—air spaces filled with endothelial cells with a few plasma cells. There is marked overgrowth of fibrous tissue throughout. In some places are found distinct areas of necrosis. No tubercles are seen in the lung sections. Tubercle bacilli are present in the sections.

Spleen: Marked overgrowth of fibrous tissue. Proliferation of endothelial cells. Type of fibrosis is diffuse or fibrillar. Tubercle bacilli present.

7-8-11. Condition of Cows No. 15 and 17 at Bryn Mawr, as follows: Cow No. 15 seems to be in good condition. Animal looks healthy, smooth coat, and appears to have a good appetite. She gives only a small amount of milk. Cow No. 17. Was ill about ten days ago with acute indigestion with obstruction, but had recovered again, although she does not seem to have a very good appetite, and has a hard dry cough. Since the cow has been ill she gives a little more milk than previously, about a teacupful night and morning.

By Dr. Dixon's direction Cow No. 15 shold be injected with a living bovine bacilli in order to determine whether or not any immunity to the bovine type of organism had been exerted by the 8 previous injections of the human type. Accordingly on July 25, 1911, she was injected (jugular vein) with 5 c. c. 0.85 per cent. NaCl suspension of culture 1-A Bovine tubercle bacilli containing 70 mg. of organisms.

AUTOPSY OF COW NO. 17.

7-25-11. Killed by blow on head and puncture of carotid. Autopsy: Cow appears in fair physical condition. Had dry cough. Considerable fat, subcutaneous, perirenal and in omentum. Sublingual gland on left side caseous. Right normal. Mediastinal glands cheesy. Inguinal, submaxillary, and axillary glands normal. Mesenteric glands contain tuberculous nodules. Bronchial glands cheesy. Large cheesy areas in left lung and in right also. Very large hard nodule in omentum. Spleen normal. One retroperitoneal haemo-lymph gland looks suspicious. Kidneys normal; liver; heart normal; mammary gland normal.

Smears from two caseous areas in lungs and from caseous sublingual and bronchial glands show numerous bacilli.

Histological Study of Sections Cow No. 17.

Lung: Shows various steps of tuberculosis from miliary tubercles with giant cells and T. B. to large caseous areas. The organisms are rather short and plump with a few exceptions where larger and somewhat degenerate forms are seen. Capillaries distended. Lymphoid cells infiltrated alveolar spaces.

Liver: Large areas show fatty and hyaline degeneration. Tubercles with T. B. are found. Considerable areas of lymphoid infiltration around the blood vessels.

Spleen: Shows miliary tuberculosis with areas of caseous degeration. T. B. found in the lesions. The capsule is thickened.

Kidney: Shows interstitial nephritis.

Lymph Glands: Caseous degeration. Short T. B. found.

Guinea Pigs Injected with material from Cows Nos. 15 and 17.

7-26-11 G. P.
1313 Injected with 0.1 c. c. of emulsion used.
1314 to inoculate Cow No. 15. (subcutaneous)
7-26-11 1305 Injected intraperitoneally with 5 c. c.
1306 of milk of Cow No. 15.
7-26-11 1303 Injected intraperitoneally with 10 c. c.
1304 of milk of Cow No. 17.
7-26-11 1307 Injected subcutaneously with 1.5 c. c.
1308 of emulsion of caseous area in lung of
Cow No. 17. (Smears show bacilli)
7-26-11 1309 Injected subcutaneously with 2.0 c. c. of
1310 emulsion of caseous bronchial gland of
Cow No. 17. (Smears show bacilli.)
7-26-11 1311 Injected subcutaneously with 2.5 c. c.
1312 of emulsion of caseous sublingual gland
of Cow No. 17. (Smears show bacilli.)
1313 General T. B. 7-26-11—9-11-11
1314 General T. B. 7-26-11—9- 2-11
1305 Milk of cow 15 7-26-11—No T. B., Killed.
1306
1303 Milk of cow 17 7-26-11—No T. B. Killed.
1304
1304 Cow 17 7-26-11—No T. B. Killed.
1307 Gen. T. B. 7-26- to 8-17-11 Lung Cow No. 17. Killed.
1308 7-26 Lung Cow No. 17. No T. B.
1309 Gen. T. B. 7-26-11 to 9-1-11 Bronchial gland Cow No. 17. Killed.
1310 7-26-11 Bronchial gland cow No. 17. No T. B.
1311 Gen. T. B. 7-26-11 to 10-5-11 Subling. gld. Cow No. 17. Killed.
1312 7-26-11 Subling gld. Cow No. 17. No. T. B.

AUTOPSY OF COW NO. 15.

9-26-11. Killed by blow on head and bleeding from carotid. Cow is fat.

Cheesy mass over right jugular vein at point of injection. Smears from this show a few beaded t. b. but it is impossible to say whether they are of the human or bovine variety. They are probably some of the organisms deposited at time of injection. *Mammary gland:* Normal.

Lymph glands: Submaxillaries, not affected. Right sublingual looks a little suspicious; Axillaries; right normal except small area of congested; left slightly doubtful. Bronchials, normal. Mediastinal: anterior is normal, posterior, cheesy with a number of small tubercles. Mesenteric lymph glands normal. Retroperitoneals congested, possibly tubercular. Right iliac congested. Inguinals normal.

The lymph glands show a chronic proliferative lymphadenitis, in which there is marked connective tissue overgrowth with endothelial cell proliferation. The connective tissue stroma cuts the pulp up into small lobules. In the bronchial and axillary lymph glands tubercles may be observed, but in none of the glands could we discern any tubercle bacilli.

Heart: Normal.

Uterus, and ovaries: Normal.

Liver: Not enlarged—macroscopically normal, but sections show chronic passive congestion. Small abscesses are scattered throughout liver substance. Moderate prolification of bile ducts. No tubercles. No tubercle bacilli found in specially stained section.

Spleen: Very little of splenic pulp remains. Marked fibrous tissue overgrowth. Plasma cells abound. Overgrowth fibrillar rather than trabecular in character. No tubercles found. Capsule is thickened.

Kidneys: Macroscopically normal but in some portions sections show considerable haemorrhage. The tubules show a degeneration of their lining cells with karyolysis and karyorhexis and exudation of these broken down cells into the lumen of the tubule. Through the section there is a general proliferation of endotheloid cells, though very little, if any, connective tissue overgrowth is observable. The capsule of Bowman is thickened and in many instances the vessels in Malpighian tufts show a hyaline degeneration. There is usually to be found on one side or another of these tufts an infiltration of epitheloid and lymphoid cells. Many of the vessels in the section show hyalinization of their walls. No tubercles. No tubercle bacilli of definite morphology could be made out in a section especially stained for the organisms.

Lungs: The left appears normal, the right has a cheesy mass, the size of a chestnut, in a lobe. In places of the section the vesicles are filled with cellular exudate of round and endothelioid cells, in other places the vesicles are free from exudate but dilated. Most of the bronchioles have a dense infiltration of round cells on one or more sides. There are a number of miliary tubercles scattered throughout the section. No organisms which might be definitely stated to be tubercle bacilli could be found in the lung sections stained especially for tubercle bacilli, though quite a number of coccoid acid fast forms were seen, which might be broken particles of, or involution forms of the tubercle bacillus. Smears from the caseous material show a few beaded tubercle bacilli. It is impossible to say whether they are of human or bovine type.

Tests with material from cow No. 15.

G. P. 1344 1345	Injected subcutaneously, 9-27-11, with caseous material from lung of cow No. 15. Not dead.	
1346 1347	Injected subcutaneously with caseous material from the abscess of the neck of cow No. 15. Dead; of general tuberculosis.	
1348	Developed general tuberculosis,	These pigs were injected with material from the axillary gland of cow No. 15.
1349	Developed general tuberculosis,	
1350	Developed general tuberculosis,	
1351	Developed general tuberculosis,	

CONCLUSION: The second control before the 7th injection of Cows Nos. 15, 16 and 17, made on February 6, 1911, showed acid fast organisms though only a few during an hour's search, in the milk of Cow No. 15. The previous injection of tubercle bacilli was made 11-30-10.

The seventh injection of cows Nos. 15, 16 and 17 was made 2-16-11. Milk contralled 4-11-11 for presence of tubercle bacilli before the 8th injection, showed acid fast organisms in the milk of Cows Nos. 16 and 17.

It may be safely stated then, in view of these experiments that acid fast organisms may be found in the milk of cows injected with tubercle bacilli, for at least two months after injection.

Immunity to infection by the bovine type of organisms could not be brought about by previous injections of the human type extending over a number of months.

No mutation in the morphology or virulence of the organisms recovered from the cows was observable.

III. VIABILITY OF THE TUBERCLE BACILLUS IN SEWAGE AND WATER.

In the annual report for 1909 we considered the pathogenicity of virulent tobercle bacilli in sewage kept under artificial conditions. We described the retention of the virulence of these organisms seeded in sewage, up to the third week but not thereafter. The following report continues this experimentation using tap and sterile distilled water suspensions of the same cultures as controls.

Viability of the Tubercle Bacillus in Sewage.—An investigation to determine the longevity of the tubercle bacillus in sewage at room temperature and at the temperature of the ice box was begun on March 15, 1910.

Sewage was collected in a large wide mouth bottle, on that date, from the mouth of the sewer below South Street Bridge, West Philadelphia, as it empties its contents into the Schuylkill river.

100 c. c. of the raw sewage was centrifugated for two hours at about 700 revolutions the minute in 10 c. c. portions.

The sediment of two tubes (20 c. c.) equalling about 2 c. c. was combined, smeared on three slides and stained with Ziehl-Nielsen Carbol Fuchsin as usual. One was decolorized in 30 per cent. nitric acid in 95 per cent. alcohol and counterstained in Loeffler's Methylene Blue solution; another was immersed in a saturated alcoholic solution of methylene blue in absolute alcohol for 10 minutes; and the third one was decolorized and stained in Pappenheim's solution for 10 minutes. Acid and alcohol-fast bacilli were not found in any of the slides.

The sediment of the remaining 80 c. c. in 8 tubes equal to about 8 c. c. was mixed and injected under the skin in 1 c. c. doses, of guinea pigs No. 872 and 873, and in the same quantity into the peritoneal cavity of guinea pigs No. 874 and 875.

To the remaining sewage, a thick emulsion in physiological salt solution of virulent bovine tubercle bacilli (1-A State Live Stock) was added and well mixed by shaking. 20 c. c. of this mixture was immediately removed and centrifugated in 10 c. c. portions, for two hours. The sediments, the last 1 c. c. in each tube, were combined and heated for 10 minutees in a water both at 50° C. to kill off streptococci, straphylococci and encapsulated organisms, and injected under the skin of guinea pig No. 876 and into the peritoneal cavity of guinea pig No. 877 in 1 c. c. doses.

As control, two flasks, one containing 365 c. c. of sterile distilled water and the other 365 c. c. of plain tap water, were inoculated with a thick emulsion of bovine tubercle bacilli (1-A State Live Stock) and the contents well mixed by shaking. 20 c. c. from each flask were immediately removed and treated in the same way as the sewage. Guinea pig No. 878 was inoculated under the skin with 1 c. c. of the sediment from the sterile distilled water and tubercle emulsion mixture, and guinea pig No. 879 was inoculated intraperitoneally with the same. Guinea pigs Nos. 880 and 881 were respectively inoculated subcutaneously and intraperitoneally with 1 c. c. of the sediment from 10 c. c. samples of the plain tap water and tubercle bacilli emulsion.

These flasks with their remaining contents were then placed on a shelf in a corner of the Laboratory out of the way of the direct sun light. They were shaken daily but not otherwise disturbed until the next test period, April 12, 1910, at the end of four weeks.

They were thenceforward treated and tested at various periods as were the flasks of sewage to which the tubercle bacillus emulsion was added, except that no bacterial count was made of the contents.

The sewage containing the emulsion of tubercle bacilli was divided into two equal parts, one being placed in the dark and kept at the temperature of the ice box, while the other was kept on a shelf in a corner of the Laboratory so that direct sun light might not gain access to it. The sample flasks of sewage like the controls, were closed only with raw cotton. They were shaken daily and not otherwise disturbed until the next test period, April 12, 1910.

The technique for handling the sewage samples at the various test periods was as follows:

The portions of 10 c. c. each were removed with a sterile pipette into test tubes and centrifugated for two hours, the supernatant fluid being removed from the last 1 c. c. in each tube, which was considered as sediment. The two sediments were combined, heated to 55 degrees C. for ten minutes and two loopfuls put on a clean side were stained as usual for tubercle bacilli, using all the decolorizing agents mentioned above. The combined sediment was diluted with sterile salt solution up to 4 c. c. Two guinea pigs were inoculated subcutaneously with 1 c. c. of the sediment for each pig, and two were inoculated with 1 c. c. each of the same material intraperitoneally.

The two sewage flasks were plated on agar to determine the bacterial count until no streptococci, staphylococci or encapsulated organisms were found on plates or in smears. The heating to 55° C. was then discontinued.

All slides made from the sediments were dated and preserved. Commencing with the test period on 10-25-10 only weak acid alcohol (10 per cent. HNO_3 in 95 per cent. alcohol) was used in decolorizing the slides. They were then counter-stained with Loeffler's alkaline methylene blue.

The bacterial count at the end of four weeks—the first test period, 4-12-10, for the flask kept in the ice box, was 50,000 per c. c. For the flask kept at room temperature, 270,000 per c. c.

The count at the end of six weeks, 4-26-10, for the refrigerator flask was 18,000. For the room temperature flask 7,000. No streptococci, staphylococci or encapsulated organisms were found on plates or in smears from the sediment made on this date.

Only one guinea pig injected with the raw sewage developed tuberculosis. This pig died three months after inoculation, and may have harbored tubercle bacilli before injection though he seemed to be perfectly healthy at the time.

The following is a complete report of the work on the "Viability of Tubercle Bacilli in Sewage," of which a preliminary report was made in 1910 as above:

After the first inoculation, 3-15-10, the pigs injected with the raw sewage to which the emulsion of tubercle bacilli had been added died of enteritis and peritonitis due most probably to organisms in the sewage whose spores had not all been killed or whose capsules had not been penetrated by the heat to which they had been subjected, before inoculation. Both pigs inoculated with distilled water infected with the tubercle bacilli emulsion died of generalized tuberculosis, the one subcutaneously injected, dying in about three months, the intraperitoneally injected, dying in about four months. In the case of the tap water infected with tubercle bacilli, the intraperitoneally injected pig died of generalized tuberculosis in about six weeks, while four months was required to kill the one injected subcutaneously.

Of the pigs of the second lot (inj. 4-12-10) those injected with distilled water plus tubercle bacilli emulsion died first, the one injected into the peritoneal cavity dying in six weeks, the one injected under the skin, in three months. The length of life of those injected with T. B. sewage kept in diffuse light, at room temperature, inoculated intraperitoneally was about two months, subcutaneously, three months.

The degree of virulence measured by the length of life of the pigs inoculated with tubercle bacilli infected sewage kept in the dark in the refrigerator was about equal in intraperitoneally and subcutaneously inoculated pigs, viz: about 10 weeks. The emulsion in tap water killed the intraperitoneal pig in seven weeks and the subcutaneous pig in six months.

The greatest virulence therefore for this second lot of pigs lay in the distilled water plus T. B. emulsion injected intraperitoneally; the next, tap water plus T. B. emulsion; then, T.B. sewage at room temperature; and lastly T. B. sewage kept in the refrigerator.

In the third group of inoculations (4-26-10) one intraperitoneal pig died of tuberculosis in 13 weeks after injection with T. B. sewage at room temperature, the other three pigs dying of intercurrent diseases.

Of the four injected with T. B. sewage kept in Refrigerator, three died of tuberculosis; two intraperitoneally injected, one in two weeks, the other in 8 weeks; one subcutaneously in 4 1-2 months.

The intraperitoneal pig injected with Distilled water and T. B. emulsion died in 5 weeks, the subcutaneous one in three months. T. B. emulsion in tap water produced results almost identical with those of the distilled water plus T. B. emulsion.

This group showed the T. B. sewage kept in the refrigerator to be most virulent.

Of the fourth group (inoculated 5-24-10) two of the four inoculated with T. B. sewage at room temperature died of tuberculosis; the intraperitoneal pig in four weeks, the subcutaneous pig in 13 weeks. T. B. sewage kept in the refrigerator gave practically the same results.

One intraperitoneal pig injected with distilled water plus T. B. emulsion died of tuberculosis in four weeks. Those injected with tap water plus T. B. emulsion died of other diseases about one month after inoculation.

In the fifth group (inoculated 7-5-10), of the two injected with T. B. sewage at room temperature intraperitoneally, one pig died in eight weeks, the other in six weeks. One subcutaneous pig died in six weeks, the other in eleven weeks.

The four pigs which received T. B. sewage kept in the refrigerator died in six to seven weeks of tuberculosis, the subcutaneous a few days before the intraperitoneal.

Distilled water plus T. B. emulsion killed both intraperitoneal and subcutaneous pigs in five weeks.

Tap water plus T. B. emulsion killed both pigs, the one inoculated subcutaneously dying a few days before the one inoculated intraperitoneally.

In the sixth group of pigs (inoculated 8-30-10) only one died of tuberculosis, and this one was injected subcutaneously with T. B. sewage kept in the refrigerator. The degree of virulence was very low reckoned by the fact that the duration of life after inoculation was about four months and seven days, and the autopsy findings revealed only a few small tubercules in lungs, liver and spleen.

Of group seven (inoculated 10-25-10) three of the four pigs inoculated with T. B. sewage at room temperature died of tuberculosis, one intraperitoneal pig and one subcutaneous pig dying on the same day one week less than five months after being inoculated, the other subcutaneous pig in nineteen weeks.

One pig inoculated intraperitoneally with T. B. sewage kept in the refrigerator died in five months and one week, one subcutaneous pig in four months and one week, the other subcutaneous pig in three months and one week.

The pig inoculated subcutaneously with distilled water plus T. B. emulsion died with tuberculous lesions three months after inoculation.

Neither of the two pigs inoculated with tap water plus T. B. emulsion died with tuberculous lesions.

In the eighth group (inoculated 12-20-10) only four of the twelve inoculated died showing evidence of tuberculosis. Two of these received T. B. sewage at room temperature; the intraperitoneally injected one dying in one month and two weeks, the one injected subcutaneously dying in four months.

Of the two which received T. B. sewage kept in the refrigerator, the subcutaneous pig died in four months, just one week earlier than the intraperitoneal pig.

In the ninth group (inoculated 3-15-11) only one pig of the twelve inoculated showed at autopsy any evidence of tuberculosis. This was one injected with T. B. sewage at room temperature, subcutaneously. Its death occurred three months after inoculation.

Only two pigs in the tenth group (inoculated 8-15-11) died showing tuberculous lesions at autopsy. One was inoculated subcutaneously with T. B. sewage at room temperature and died in seven months lacking a week. The other received distilled water plus T. B. emulsion intraperitoneally and died in seven months.

None of the pigs of the eleventh group (inoculated 11-15-11) have become infected with tuberculosis up to the time this report was written—six months from the time of inoculation,—though several have died of other causes and three were killed to determine the existence of any tuberculous lesions if any. None were found.

TABLE OF INOCULATIONS TO DETERMINE THE VIABILITY OF TUBERCLE BACILLI IN SEWAGE EXPERIMENTS.

Material Used. Date of Tests and Inoculations.	Smears of sed. of 2 tubes stained for T. B.			Nos. of guinea pigs.	Quantity and place of inoculation (subcutaneous or intraperitoneal).	Date, and causes of death of guinea pigs.
	Pappenheim.	Alc. meth. blue.	Decolored by 30% HNO_3.			
Raw Sewage March 15, 1910.	—	—	—	872	S 2 C. C.	872 3-19-10 died acute enteritis and peritonitis.
				873	S 2 C. C.	873 1-11-11 killed—No T. B.
				874	I 2 C. C.	874 6-7-10 died T. B.
				875	I 2 C. C.	875 3-18-10 died gastroenteritis.
T. B. Sewage 3-15-10.	+	+	+	876	S 1 C. C.	876 3-18-10 died gastroenteritis.
				877	I 1 C. C.	877 3 25-10 died purulent perit.
Aq. Dest.+ T. B. Emuls. 3-15-10.	+	+	+	878	S 1 C. C.	878 6-6-10 died T. B. (liver and ing. gland).
				879	I 1 C. C.	879 4-28-10 died Gen. T. B.
Plain Tap+ T. B. Emuls. 3-15-10.	+	+	+	880	S 1 C. C.	880 7-10-10 died Gen. T. B.
				881	I 1 C. C.	881 4-29-10 died Gen. T. B.
T. B. Sewage (Room Temp.) 4-12-10.	+	+	+	903	I 1 C. C.	903 6-6-10 died Gen. T. B.
				904	I 1 C. C.	904 6-4-10 died Gen. T. B.
				905	S 1 C. C.	905 7-9-10 died Gen. T. B.
				906	S 1 C. C.	906 7-7-10 died Gen. T. B.
T. B. Sewage (Refrigerator) 4-12-10.	+	+	+	907	I 1 C. C.	907 6-14-10 died Gen. T. B.
				908	I 1 C. C.	908 7-10-10 died Gen. T. B.
				909	S 1 C. C.	909 7-6-10 died Gen. T. B.
				910	S 1 C. C.	910 6-1-10 died Gen. T. B.
Aq. Dest.+ T. B. 4-12 10.	+	+	+	911	I 1 C. C.	911 5-24-10 died Gen. T. B.
				912	S 1 C. C.	912 6-13-10 died Gen. T. B.
Plain Tap+ T. B. 4-12-10.	+	+	+	913	I 1 C. C.	913 7-5-10 died Gen. T. B.
				914	S 1 C. C.	914 9-26-10 died Gen. T. B.
T. B. Sewage (Room) 4-26-10.	+	+	+	917	I 1 C. C.	917 6-10-10 died pneumonia and gastroenteritis.
				918	I 1 C. C.	918 8-2-10 died Gen. T. B.
				919	S 1 C. C.	919 6-21-10 died gastroenteritis.
				920	S 1 C. C.	920 8-15-10 died cause unknown.
T. B. Sewage (Refrig.) 4-26-10.	+	+	+	921	I 1 C. C.	921 5-6-10 died Gen. T. B.
				922	I 1 C. C.	922 6-20-10 died Gen. T. B.
				923	S 1 C. C.	923 7-6-10 died cause unknown.
				924	S 1 C. C.	924 9-10-10 died Gen. T. B.
Aqua Dest. + T. B. 4-26-10.	+	+	+	925	I 1 C. C.	925 6-7-10 died Gen. T. B.
				926	S 1 C. C.	926 7-21-10 died Gen. T. B.
Plain Tap + T. B. 4-26-10.	+	+	+	927	I 1 C. C.	927 6-7-10 died Gen. T. B.
				928	S 1 C. C.	928 7-6-10 died Gen. T. B.
T. B. Sewage (Room) 5-24-10.	+	+	+	942	I 1 C. C.	942 7-5-10 died enteritis.
				943	I 1 C. C.	943 6-21-10 died Gen. T. B.
				944	S 1 C. C.	944 ——— died, unknown.
				945	S 1 C. C.	945 8-1-10 died Gen. T. B.
T. B. Sewage (Refrig.) 5-24-10.	+	+	+	946	I 1 C. C.	946 ——— died unknown.
				947	I 1 C. C.	947 6-21-10 died Gen. T. B.
				948	S 1 C. C.	948 5-27-10 died peritonitis.
				949	S 1 C. C.	949 8-9-10 died Gen. T. B.
Aq. Dest. + T. B. 5-24-10.	+	+	+	952	I 1 C. C.	952 6-10-10 died Gen. T. B.
				953	S 1 C. C.	953 ———died, cause unknown.
Tap + T. B. 5-24-10.	+	+	+	950	I 1 C. C.	950 6-15-10 died enteritis.
				951	S 1 C. C.	951 7-27-10 died enteritis.
T. B. Sewage (Room) 7-5-10.	+	+	+	1014	I 1 C. C.	1014 9-6-10 died Gen. T. B.
				1015	I 1 C. C.	1015 8-23-10 died Gen. T. B.
				1016	S 1 C. C.	1016 8-23-10 died Gen. T. B.
				1017	S 1 C. C.	1017 9-27-10 died Gen. T. B.

CONTINUATION OF PROTOCOLS.

Material Used. Date of Tests and Inoculations.	Smears of sed. of 2 tubes stained for T. B.			Nos. of guinea pigs.	Quantity and place of inoculation (subcutaneous or intraperitoneal).	Date, and causes of death of guinea pigs.
	Pappenheim.	Alc. meth. blue.	Decolored by 30% HNO_3.			
T. B. Sewage (Refrig.) 7-5-10.	+	+	+	1018 1019 1020 1021	I 1 C. C. I 1 C. C. S 1 C. C. S 1 C. C.	1018 8-23-10 died Gen. T. B. 1019 8 23-10 died Gen. T. B. 1020 8-20-10 died Gen. T. B. 1021 8-13-10 died Gen. T. B.
Aq. Dest.+ T. B. 7-5-10.	+	+	+	1022 1023	I 1 C. C. S 1 C. C.	1022 8-13-10 died Gen. T. B. 1023 8-13-10 died Gen. T. B.
Plain Tap+ T. B. 7-5-10.	+	+	+	1024 1025	I 1 C. C. S 1 C. C.	1024 10-2-10 died Gen. T. B. 1025 9-30-10 died Gen. T. B.
T. B. Sewage (Room) 8-30-10.	+	+	+	1043 1044 1045 1046	I 1 C. C. I 1 C. C. S 1 C. C. S 1 C. C.	1043 9-21-10 died cause unknown. 1044 9-15-10 died pneumonia. 1045 9-21-10 died enteritis. 1046 9-19-10 died pneumonia.
T. B. Sewage (Refrig.) 8-30-10.	+	+	+	1047 1048 1049 1050	I 1 C. C. I 1 C. C. S 1 C. C. S 1 C. C.	1047 9-15-10 died pneumonia. 1048 9-16-10 died enteritis. 1049 9-14-10 died Gen. T. B. 1050 9-15-10 died enteritis.
Aq. Dest.+ T. B. 8-30-10.	+	+	+	1051 1052	I 1 C. C. S 1 C. C.	1051 9-2-10 died pneumonia. 1052 9-5-10 died enteritis.
Plain Tap+ T. B. 8-30 10.	+	+	+	1053 1054	I 1 C. C. S 1 C. C.	1053 9-20-10 died cause unknown. 1054 9-21-10 died enteritis.
T. B. Sewage (Room) 10-25-10	+	+	+	1081 1082 1083 1084	I 1 C. C. I 1 C. C. S 1 C. C. S 1 C. C.	1081 3-14-11 died Gen. T. B. 1082 11-10-10 died enteritis. 1083 2-6-11 died Gen. T. B. 1084 3-14-11 died Gen. T. B.
T. B. Sewage (Refrig.) 10-25-10.	+	+	+	1085 1086 1087 1088	I 1 C. C. I 1 C. C. S 1 C. C. S 1 C. C.	1085 3-30-11 died Gen. T. B. 1086 2-10-11 died pneumonia. 1087 1-30-11 died Gen. T. B. 1088 3-1-11 died Gen. T. B.
Aqua Dest.+ T. B. 10-25-10.	+	+	+	1089 1090	I 1 C. C. S 1 C. C.	1089 —— died cause unknown. 1090 1-20-11 died Gen. T. B.
Plain Tap+ T. B. 10-25-10.	+	+	+	1091 1092	I 1 C. C. S 1 C. C.	1091 2-24-11 died enteritis. 1092 Not dead.
T. B. Sewage (Room) 12-20-10.	+	+	+	1103 1104 1105 1106	I 1 C. C. I 1 C. C. S 1 C. C. S 1 C. C.	1103 1-30-11 died pneumonia. 1104 2-2-11 died Gen. T. B. 1105 4-24-11 died Gen. T. B. 1106 1-30-11 died pneumonia.
T. B. Sewage (Refrig.) 12-20-10.	+	+	+	1107 1108 1109 1110	I 1 C. C. I 1 C. C. S 1 C. C. S 1 C. C.	1107 1-23-11 died pneumonia. 1108 4-21-11 died Gen. T. B. 1109 8-19-11 died Gen. T. B. 1110 1-14-11 died enteritis.
Aq. Dest.+ T. B. 12-20-10.	+	+	+	1111 1112	I 1 C. C. S 1 C. C.	1111 3-8-11 died ent. and endometritis. 1112 not dead.
Plain Tap+ T. B. 12-20-10.	+	+	+	1113 1114	I 1 C. C. S 1 C. C.	1113 1-27-11 died pneumonia. 1114 2-5-11 died pneumonia.

VIABILITY OF T. B. IN SEWAGE (Continuation of Protocols).

Nature of material inoculated and date.	Smears from sed. stained for T. B.	Nos. of guinea pigs inoculated.	Quantity and place of inoculation.	Date, and causes of death
T. B. Sewage (Room) 3-15-11.	+	1204	1 C. C. 1	1204 12-20-11 pneumonia.
		1205	1 C. C. 1	1205 12-20-11 killed. No evidence of T. B
		1206	1 C. C. S	1206 6-18-11 died Gen. T. B.
		1207	1 C. C. S	1207 11-16-11 died pneumonia.
T. B. Sewage (Refrig.) 3-15-11.	+	1208	1 C. C. I	1208 12-20-11 died pneumonia.
		1209	1 C. C. I	1209 12-30-11 killed. No evidence of T. B.
		1210	1 C. C. S	1210 ——— died post-partum haemorrhage.
		1211	1 C. C. S	1211 ——— died post-partum haemorrhage.
Aq. Dest. + T. B. 3-15-11.	+	1212	1 C. C. I	1212 3-15-12 died pneumonia.
		1213	1 C. C. S	1213 living.
Plain Tap + T. B. 3-15-11.	+	1214	1 C. C. I	1214 living.
		1215	1 C. C. S	1215 3-6-12 died pneumonia.
T. B. Sewage (Room) 8-15-11.	+	1321	1 C. C. I	1321 4-20-12 killed epidemic epizootic infection. T. B. not found.
		1322	1 C. C. I	1322 living.
		1323	1 C. C. S	1323 8-17-11 died peritonitis.
		1324	1 C. C. S	1324 living.
T. B. Sewage (Refrig.) 8-15-11.	+	1325	1 C. C. I	1325 3-12-12 died pneumonia.
		1326	1 C. C. I	1326 12-16-11 died contusions during pregnancy.
		1327	1 C. C. S	1327 3-8-12 died Gen. T .B.
		1328	1 C. C. S	1328 living.
Aq. Dest. + T. B. 8-15-11.	+	1329	1 C. C. I	1329 3-12-12 died Gen. T. B.
		1330	1 C. C. S	1330 ——— died pneumonia.
Plain Tap + T B. 8-15-11.	+	1331	1 C. C. I	1331 ——— living.
		1332	1 C. C. S	1332 11-22-11 died pneumonia.
T. B. Sewage (Room) 11-15-11.	+	1358	1 C. C. I	1358 4-30-12 killed. No T. B. found.
		1359	1 C. C. I	1359 2-20-12 died pneumonia.
		1360	1 C. C. S	1360 12-19-11 died enteritis.
		1361	1 C. C. S	1361 4-22-12 killed epizootic infection. No T. B. found.
T. B. Sewage (Refrig.) 11-15-11.	+	1362	1 C. C. I	1362 living.
		1363	1 C. C. I	1363 living.
		1364	1 C. C. S	1361 4-30-12 killed. T. B. not found.
		1365	1 C. C. S	1365 4-30-12 killed. T. B. not found.
Aq. Dest. + T. B. 11-15-11.	+	1366	1 C. C. I	1366 12-3-11 died enteritis.
		1367	1 C. C. S	1367 4-30-12 killed. No T. B. found.
Plain Tap + T. B. 11-15-11.	+	1368	1 C. C. I	1368 4-30-12 killed. No. T. B. found.
		1369	1 C. C. S	1369 4-22-12 killed epizootic infection. No T. B. found.

Tubercle bacilli were found in the smears of the sediments of all material used in the inoculation of pigs from the time the emulsion of tubercle bacilli was put into each of the four flasks, 3-15-10, until the material in those flasks had all been used, 11-15-11.

Some of the notes made at the time of examination of the smears of the sediments from the flasks on the dates on which inoculations were made have been recorded as follows:

5-24-10. T. B. of slides made from sediment seem to have lost some of their distinct outlines. Few granulations were seen.

5-24-10. Slides showed no streptococci or other bacterial forms. Sediment was therefore not heated before inoculating pigs.

8-30-10. T. B. in Aq. dest. are plentiful some taking carbol fuchsin stain decidedly by while many others are only faintly red.

10-25-10. Some noted, with blue bodies and red granules among bright red and faint red ones. All seem to be of same morphology. This in Aq. dest.

3-15-11. Smears still show many T. B. (acid fast). There are some of tubercle bacilli morphology except that they are stained blue. The granulations are also blue. The red bacilli seem shorter than those seen in the stained sediment from material contained in the flasks a year ago.

8-15-11. Smears of all samples show acid fast T. B. In smears from sewage sediment, especially from sewage kept in refrigerator, there appear aggregations of acid fast T. B. immediately surrounding which are great numbers of non-acid fast organisms of the same morphology taking blue stain. These I believe to be tubercle bacilli, which by attenuation due to the age of the medium have lost their acid fast properties.

The acid fast bacilli seen in the smears from sediment of all samples have lost their dark granulations, or at least the granulations have been rendered very indistinct.

10-25-11. Virulence is diminished very greatly though the bacilli are still present in in the smears from the sediment.

As seen in the pig protocols the virulence of the bacilli was very greatly lessened in sewage, distilled water, and tap water at the end of five and a half months. Until the end of ten weeks the degree of virulence in sewage at room and refrigerator temperature, and in distilled and tap water was about the same, and the pigs injected intraperitoneally succumbed to tuberculosis as a rule earlier than those injected under the skin. After that period those injected subcutaneously seemed to contract the disease fully as readily as those inoculated into peritoneal cavity.

After seven months in the flasks the virulence of the tubercle bacilli dropped greatly in sewage at both room and refrigerator temperature and markedly so in distilled and tap water, diminishing after that, in distilled and tap water, to practically nothing and nearly so in sewage, taking six to eight months to kill.

In conclusion it may be said that tubercle bacilli live longest in sewage kept at room temperature away from the direct rays of the sun, and that their viability in sewage extends over a period of about a year and a half.

It would also seem advisable to call attention to the non acid fast forms of the same morphology as the acid fast tubercle bacilli, and immediately surrounding them, found in the sediments in increasing numbers, as the age of the sewage or water in which the tubercle bacilli were planted, increases. These we believe are tubercle bacilli which have lost their power of retaining the carbol fuchsin stain when decolorized as ordinarily practiced in staining to determine the presence of the tubercle bacillus, and their virulence is at a very low ebb if in fact they possess any whatsoever.

IV. EXPERIMENTS ON POLIOMYELITIS.

Since the report of 1910 experimental work in the laboratories on acute poliomyelitis has been carried on uninterruptedly throughout the year. During the summer of 1911 through the courtesy of the attending physician, and of Dr. Joseph Neff, Director of the Department of Public Health of the city of Philadelphia, to whose department the cases were reported, Dr. Rucker has been permitted to see sixteen cases of acute poliomyelitis in children and obtain specimens of blood from them. Microscopical examinations of fresh blood and stained smears were made to seek the rod shaped organism that has been so generally found in the blood of monkeys suffering from experimental poliomyelitis and reported in the Bulletin of the Pennsylvania Department of Health issued 3-2-11 and in a paper by Dr. Samuel G. Dixon, read in the section on Practice of Medicine of the American Medical Association held at Los Angeles, Cal., June 1911, entitled "Epidemiologic and Etiologic Studies of Acute Poliomyelitis in Pennsylvania." This paper by Dr. Dixon was published in the American Journal of Diseases of Children, October 1911, Vol. 2, pp. 221-242.

The organisms were found in the fresh blood in 13 of these cases. In the stained smears in 11. No organisms of this type were found in two cases either in fresh blood or stained smear. In four cases were organisms similar to the one isolated from the blood of monkey No. 32, but having more of a diphtheroid appearance when isolated in pure culture.

A table of this work in the examination of the blood of children suffering from acute poliomyelitis will be found further on in the report.

We have tried repeatedly to infect monkeys Nos. 37, 42, 55 and 63, with poliomyelitis by the intracerebral, intravenous, and subcutaneous routes by inoculation of this rod shaped, bulbous-end micro organism in pure culture, and also mixed with the Gram positive diplococcus found so constantly in the bodily secretions in so many of the cases examined and described in the Commissioner's report for 1908, and in the epidemic of 1910. We have never been successful in any of these attempts.

Repeated injections of the organism in pure culture into a monkey (55) has also been tried in the hope of producing an immunity to an active virus which was injected into the brain after the series of injections of the organism had come to an end. The attempt at immunization in this way was without avail as the animal contracted the disease from the injection of virus after the average length of incubation period and the severity of the symptoms was as great as in the control animal.

Two monkeys (36 and 50) were given at different times quantities of virulent poliomyelitis cord substance varying from 0.5 to 1.5 grams emulsified in normal salt solution, by the stomach tube in order to determine infectibility through the digestive tract; neither one of these animals contracted the disease.

We have been successful in immunizing monkeys (39, 40, 41) against the virus by injecting blood serum from an immune monkey (number 5) intravenously at the time of, and after inoculation with the virus. The control (Monkey number 38) contracted the disease.

Serum from a recovered monkey (number 35) injected under the skin before inoculation of an active virus into the brain fully protected monkey number 57. This same serum did not relieve the paralysis of a monkey after it had begun (number 56).

Emulsion of the cord of an immune monkey (number 5) injected under the skin on three different occasions two days apart did not protect against the virus (number 56.)

Experiments as to the efficacy of formaldehyde solutions injected into the spinal canal were continued, but the results were negative (number 47, 49, 50, 52.)

Below are found the protocols of experiments on monkeys during the year 1911, and notes on several animals on which experiments were made last year, but whose histological notes were not given them because the animals had not died before the report was written, and for that reason their whole experimental history is again recited. The whole history of experiments on No. 5, the immune monkey, is given again in order to make clear some of our experiments on the production of immunity.

PROTOCOLS OF EXPERIMENT.

Monkey No. 20. Etherized, trephined and inoculated intracerebrally 8-31-10, with 1 c.c. emulsion of spinal cord, medulla and pons of Case No. 53. 9-9-10, paralyzed in right leg. 9-10-10, paralyzed in both legs, no paralysis of arms, eats heartily; made blood smears and buillon cultures. 9-12-10 withdrew 4 c. c. of blood from vein in leg into 3 c. c. 1.5 per cent. sodium citrate solution and injected it under the skin of monkey No. 5-B. Made blood count and blood smears on this day. Paralysis never extended further than to incapacitate both legs. 12-5-10, animal is well and lively, but complete paralysis of legs still remains. He swings up on the bars of his cage with his arms and drags his legs to the ledge where he rests them.

Date.	Whole count.	Polyuuclear %.	Small %.	Large %.	Eosinophile %.
9-10-10, ...	......	36.2	55.7	5.2	2.9
10-12-10, ...	14,000	27.	56.5	14.	2.5

12-30-11. Some residual contracture in left leg though use is only slightly impaired. Right leg contracted tightly but with good use of toes. Bright and lively. 6-13-12. Same condition as at former note. Injected 2 c. c. emulsion of T. B. (culture H-37) under skin of abdomen. Killed because of great dyspnoea. Cause of dyspnoea, pleurisy. Sections of lung, axillary and inguinal glands and spinal cord preserved. As much serum as possible withdrawn from the heart just before death and preserved.

Histological Notes. Inguinal and axiliary glands showed well formed tubercles and showed B. tuberculosis in great numbers. Lung full of tubercles. Cord—a great many motor cells in anterior horns of gray matter, but gray matter filled with an overgrowth of fibrous tissue with a few round cells scattered here and there, but the number is not great.

Monkey No. 29. Leucocyte count and blood smears made on 11-7-10. Lumbar puncture resulted in a dry tap. Etherized, trephined and inoculated with 3 c. c. of the filtrate of the normal saline emulsion of the cord of Monkey No. 12 (5 grams to 20 c. c.) This monkey was used as control for Monkey No. 30. 11-8-10 lively and well. Collodion dressing on head renewed. 11-9-10 well. Lumbar puncture resulted in a dry tap. 11-11-10, well. By lumbar puncture 6 drops of spinal fluid were withdrawn. 11-12-10, hair ruffled, not well. 11-14-10, favors left arm and hand. This member seems weaker than normal though grasp is not entirely lost. When at rest the animal puts his arm upon his knee and lets his left wrist hang limp. 11-16-10, palsy of all members, though more marked in left arm. No distinct paralysis. Left eyelid is also palsied. 11-18-10, cannot stand on hind legs though able to pull himself up and hold to bars with hands. Grasp in feet is weak but has not entirely disappeared. Lumbar puncture resulted in dry tap, but .1 c. c. of 4 per cent. formaldehyde was injected into his spinal canal. 11-19-10. He seems a trifle better. 11-21-10. Right leg paralyzed, hanging limp, weakness in left arm still exists, though no progression of paralysis. 11-23-10. Condition is the same except that he eats better. 11-24-10. 7 c. c. of a 1 per cent. formaldehyde solution was injected into the right femoral vein. 11-25-10. The same condition as before the injection of formaldehyde exists. 11-26-10. Left arm stronger, can grasp well, is able to move right foot and flex toes. 11-28-10. Left arm practically normal, right leg improved so that he can jump on to the cage bars dragging the leg. He can grasp with toes of right foot but has very little power in leg muscles. 12-3-10. No further improvement in paralysis since 11.28-10. 12-14-10, Almost entirely recovered use of right leg, still some lagging however. 12-14-10. Inoculated intracerebrally with 3 c. c. emulsion of cord. pons and bulb of Monkey No. 31, (1 gram to 10 c. c. of salt solution) to determine ability to infect a recovered monkey. Animal well to date, 12-27-10. 1-3-11, well and lively.

Date.	Whole count.	Polynuclear %.	Small %.	Large %.	Eosinophile %.
11- 7-10,	18,200	19.	79.	1.	1.
11- 9-10,	14,000	25.	72.	3.	0.
11-11-10,	12,300	24.5	70.	3.7	1.
11-14-10,	23,200	72.3	27.5	.2	0.
11-16-10,	7,600	32 8	65.6	1.2	.4
11-18-10,	12,000	54.8	38.	5.8	1.4
11-21-10,	10,300	63.8	30.5	4.3	1.4
11-23-10,	12,300	56.	34.8	6.6	2.6
11-25-10,	13,400	62.8	27.2	5.8	3.2
11-28-10,	13,000	52.1	40.4	5.6	1.9
11-30-10,	10,850	55.2	35.4	7.3	2.1
12- 3-10,	8,600	60.	35.	2.5	2.5
12- 5-10,	30,800	80.9	17.6	.5	1.0
12- 7-10,	11,300	64.	32.	3.8	.2
12- 9-10,	13,000	55.	38.6	4.1	2.3
12-12-10,	8,500	31.6	62.	3.7	2.7
12-16-10,	11,500	58.3	36.2	4.1	1.4
12-21-10,	10.300	36.2	53.9	3.6	6.3
12-24-10,	12,000	58.	36.8	.9	4.3

The inability to infect this monkey with an active virus inoculated into his brain on 12-14-10 proves conclusively that one attack of poliomyelitis protects against a second one. 5-18-11. Chloroformed. Autopsy revealed a generalized tuberculosis.

Monkey No. 32. 12-19-10. Etherized and inoculated intraveneously with 6 c. c. of the mixture of equal parts of emulsion of cord of Monkey No. 31 and 4 per cent. formaldehyde into left brachial vein. Well and lively until 1-16-11, when he was again etherized and inoculated intracerebrally with 3 c. c. emulsion of glycerinated cord of Monkey No. 14, in normal saline. He was immediately given under the skin 4 grains of bisulphate of quinine. 1-17-11 given 8 grains quinine bisulphate under the skin. 1-19-11, 12 grains under the skin. 1-20-11, 12 grains under the skin. 1-21-11 palsy of left arm, rests arm on knee while sitting. Is able to grasp with left hand but grip is weak. On the 22nd and 23rd his condition was unchanged except for a serous diarrhoea. 1-25-11 palsy of right leg. 1-26-11 paralysis of arms and legs. 1-27-11, same condition. Down on the floor of the cage, eyes bright, able only to move head. Chloroformed. Heart's blood taken for culture. Brain and cord removed, sections preserved in 4 per cent. formaldehyde for histological examination. Cultures of central nervous system in bouillon. Blood cultures in bouillon. The remainder of central nervous system placed in 50 per cent. glycerine. On examination the brain showed a slight injection of the vessels of the cortex. There was a blood clot in the brain substance in the left frontal regions about the size of a dime.

From the blood a rod shaped bulbous-end organism of the type described in the Penna. Dept. of Health Bulletin issued 3-2-11, was found. We have kept this particular organism in stock and are now transferring it on plain agar slants with no difficulty whatever about once a month.

Histological examination. Cerebrum: Gray substance contains numerous round cells. Vessels congested and walls infiltrated with round cells. Cerebellum: Same change as in cerebrum. Pons: Pontine nuclei intact. Very little change, if any, from normal. Medulla: Great amount of oedema. Gray matter peppered with round cells. Some vessel walls are solidly lined with them. Others have their lumina completely plugged with these round cells. No motor cells apparent. Cord: Motor cells wiped out entirely. Vessels plugged with round cells. Great oedema of tissue.

Monkey No. 33. Control for Monkey No. 32. 12-19-10. Inoculated intravenously into left brachial 3 c. c. emulsion of cord of Monkey No. 31. Seemed well after recovery from operation until 12-31-10, when his hair became ruffled, eyes put on a worried, anxious expression. Trembling in all parts of his body. Head shaky, simulating paralysis agitans in appearance. 1-11-11, seems in about same condition. 1-3-11 much better. 1-5-11 about normal in appearance. 1-7-11 there is an indisposition to jump upon the bars of the cage and when he does so he seems awkwardly slow. It appears that his hind legs are somewhat weaker than normal. 1-16-11 well. On 1-16-11 he was etherized and inoculated intracerebrally with 3 c. c. normal saline emulsion of glycerinated cord of Monkey No. 14. Immediately 5 c. c. of Esco-Raco 2 per cent. solution was injected into his right brachial vein. 1-19-11 8 c. c. 2 per cent, solution Esco-Raco into left femoral vein. Right arm paralyzed due to nerve trauma. 1-25-11, well and lively. 1-30-11, well and lively remaining so until shortly before his death. This animal evidently had a mild attack from the first injection with virus of monkey No. 31 into the vein, so that a second injection intracerebrally failed to infect him. 6-20-12 died of generalized tuberculosis.

Histological notes. Cervical cord. Anterior horns of gray matter show large multipolar ganglion cells among which are scattered a few round cells. There are several haemorrhages in the gray matter of both horns, anterior and posterior.

The blood vessel walls are in some instances infiltrated with round cells. Lumbar cord: About the same condition prevails as in the section of cervical cord, except that not so many motor cells are seen and probably a few more round cells.

Monkey No. 34. Etherized, trephined and inoculated intracerebrally 1-16-11 with 3 c. c. emulsion of glycernated cord in normal saline. Cord was that of Monkey No. 14. This animal was used as control for Monkey 32-A and No. 33-A. 1-25 hair ruffled, anxious look, shivers. 1-27 left leg palsied. 1-30 shaky. Paralysis has progressed no further. Killed 7-1-12 because of great dyspnoea. Pneumonia cause of dyspnoea. Organs other than lungs normal. Cord showed only a slight fibrosis in anterior horn. No round cells.

Monkey No. 35. 2-1-11. Inoculated intracerebrally with 3 c. c. emulsion of cord of Monkey No. 12. Immediately thereafter 7 c. c. of a 20 per cent. solution of Esco-Raco was injected into the left femoral vein. 2-10-11 legs weak but not paralyzed. On the next day, however, both his legs were paralyzed and the animal was sitting down on the floor of the cage. 2-13-11 right arm paralyzed. Cannot rise from floor of cage. 2-14-11 practically helpless. 2-17-11 about the same condition. Chloroformed. 100 c. c. of blood withdrawn for serum. Brain and cord removed and sections of cortex, cerebellum, pons, bulb and cord preserved in 4 per cent. formaldehyde for histological examination. Sections of central nervous system placed in 50 per cent. glycerine for virus. Smears of brain and cord made. No abscess or tumor of any kind in brain or cord. Typical poliomyelitis lesions of cord, bulb and pons, on histological examination. Cerebrum and cerebellum negative except for considerable congestion of blood vessels.

Monkey No 36. On three successive occasions this monkey received by means of stomach tube quantities of cord substance from poliomyelitis monkeys varying between .5 and 1.5 grams. He also received one loopful of a gram positive diplococcus isolated from the spinal fluid of Dr. Whitcomb's case along with the emulsion of cord substance. This animal remained well, showing inability to infect him with poliomyelitis by means of introduction of virus into the stomach. On 4-7-11, he was inoculated intracerebrally with 5 c. c. of an emulsion of cord of Monkey No. 35. On 4-10-11 he died. Organs were normal, brain and cord normal. Death probably due to intracranial pressure. Brain or cord showed no round cell infiltration.

Monkey No. 37. 3-1-11 inoculated intracerebrally with 5 c. c. defibrinated blood of Monkey No. 35. Slow recovery from operation. 4-10-11 never has shown any evidence of paralysis though depression lasted for three or four weeks, probably due to intracranial pressure. On this date he was inoculated and on three successive days thereafter with 4 c. c. of a two day old bouillon culture of the organism discovered in the blood of poliomyelitis monkeys and isolated therefrom. These inoculations were made subcutaneously. 4-15-11 right arm weak but not paralyzed. He remained in this condition until 4-25-11, when he was etherized and inoculated intracerebrally with 4 c. c. of the filtrate of the poliomyelitis (?) organism grown in salt solution emulsion of a brain and cord of another monkey for three days. No result. 7-11 11 very thin but active. Etherized, trephined and injected 3 c. c. of a culture of poliomyelitis (?) organism incubated in collodion sac placed in guinea pig's abdominal cavity for five days. Died 7-12-11 from shock of operation. No evidence of poliomyelitis in central nervous system.

Monkey No. 38. Control for Monkeys Nos. 39, 40 and 41. 3-24-11, inoculated intracerebrally with 3 c. c. virus of Monkey No. 32. Took blood smears. 3-25-11, blood smears taken; 3-26-11 blood smears taken; poliomyelitis (?) organisms found. 3-27, 3-28 and 3-29-11, blood smears were taken and organism found. Animal looks shaky, hair ruffled, anxious look in eyes on 3-30-11. The next day he was in the same condition. Blood smears were made and the organism was found in the fresh blood. 4-1-11. Animal depressed. 4-3-11 very wabbly and depressed, right leg slow in action. 4-4-11 slight change for the worse. 4-8-11 very wabbly and slow. Seems more ill to-day than ever. Weakness in both legs very noticeable. Organism found in blood to day. 4-10-11, condition about the same. There is no change until 4-18-11, when the monkey became very weak. On this day his blood showed the presence of the organism. 4-19-11 died. Brain and cord removed. No tumor or abscess in either. Sections of all parts of central nervous system preserved for a histological examination. Remainder put in 50 per cent, glycerine. Internal organs: Generalized tuberculosis.

Histological notes: No change in cerebral cortex, except a rather marked congestion of the blood vessels. Cerebellar vessels are also congested but no round cell infiltration of their walls has occurred. Pons: Vessels congested. In the walls of some there is a moderate round cell infiltration. Pontine cells are abundant and here and there are scattered throughout the gray substance numerous round cells. Medulla: Motor cells numerous and intact. Numerous round cells throughout the gray matter. Vessels are congested but there is very little infiltration of their walls with round cells. Cord: Motor cells intact. Gray matter full of round cells. Vessels congested but not infiltrated. Lumber cord shows only a few motor cells and the gray matter is heavily infiltrated with round cells. The appearance of the cord on histological examination gives positive evidence of poliomyelitis.

Monkey No. 39. 3-24-11. Injected into barin 4 c. c. equal parts of Monkey No. 5 serum and emulsion of cord of Monkey No. 32. This animal continued well and lively after recovery from operation. 4-27-11. Tried to infect with an active virus but was unsuccessful. In this case serum of an immune monkey mixed with an active virus in vitro rendered the latter impotent.

Monkey No. 40. 3-24-11. 3 c. c. of an emulsion of cord of Monkey No. 32 injected intracerebrally. 4 c. c. blood serum Monkey No. 5 (immune monkey) injected into left femoral vein. 3-25-11 4 c. c. serum Monkey No. 5 into right femoral vein. Animal never became ill from poliomyelitis. 11-23-11, died of pneumonia. No evidence of poliomyelitis in brain or cord. The serum fully protected this animal having been given before symptoms of poliomyelitis developed.

Monkey No. 41. 3-24-11, 3 c. c. of the emulsion of cord of Monkey No. 32 introduced into brain. 4-1-11, moving organism found in fresh blood of this animal. 4-3-11, animal depressed, hair ruffled. 9 c. c. of Monkey No. 5 serum injected into right femoral vein. In blood culture made in bouillon on 4-1-11 many motile organisms were found. Animal much depressed, very little power in legs, though animal jumps about, moving them slowly. 4-5-11, still depressed. Injected 10 c. c. of serum Monkey No. 5 into left femoral vein. Died during night of 4-5-11. Organs normal, brain and cord normal. Sections of all parts of central nervous system preserved in 4 per cent. formaldehyde for histological examination, remainder of it preserved in 50 per cent. glycerine for virus. Death probably due to anaphylaxis.

Histological notes. Brain is very greatly congested and tissue heavily infiltrated with round cells. Tissue is oedematous. Cerebellum: Round cells abundant in some parts of section, much congestion but only a slight oedema of the tissues. Pons: Tissue oedematous and vessels greatly congested. Round cells rather abundant. Motor cells intact. Medulla: Tissue oedematous. Great congestion of blood vessels. Round cells throughout tissue in great numbers. Very few motor cells present in the section. Cord. Tissue oedematous. Great congestion of blood vessels. Great number of round cells in gray matter especially in anterior horns. Number of motor cells is little, if any, reduced though many of them take the nuclear stain faintly. There is no infiltration of the vessel walls with round cells. In this case, it is well to note that the immune serum was not given until premonitory symptoms of poliomyelitis had begun to develop.

Monkey No. 42. 3-24-11. Injected 3 c. c. poliomyelitis organism (?) grown on central nervous system agar medium in bouillon suspension into brain. 4-1, organism found in fresh blood. 4-3, animal slightly depressed. 4-10, inoculated intracerebrally with 3 c. c. 2 day old culture of poliomyelitis organism (?) isolated from the blood of Monkey No. 32. Also injected 4 c. c. under the skin. 4-11, injected 4 c. c. 3 day old bouillon culture of same organism under the skin. 4-13, 4 c. c. 2 day bouillon culture, same organism, under skin. 4-14, 4 c. c. 3 day bouillon culture under the skin. 4-18, 5½ c. c. 8 day old bouillon culture of same organism under the skin. 4-19, well and lively. 4-20, not well, slow in movement, hair ruffled. 4-21-11. Very weak. Lies on perch with head and chest on perch and hind legs up—exaggerated knee chest position. 4-22-11, died. Brain congested. No abscess or tumor in brain or cord. There were a few drops of spinal fluid in the subdural space of the cord. Internal organs were all congested. Emulsion of central nervous system made and injected into brain of Monkey No. 45. Sections of all parts of C. N. S. preserved for histological examination in 4 per cent. formaldehyde, the remainder put into 50 per cent. glycerine. Culture of heart's blood made in bouillon. Made smears of the few drops of spinal fluid found but no organism was demonstrable.

Histological notes. Cerebrum: Marked congestion. Many small areas of degeneration. A few round cells may be seen in many of the vessel walls. Cerebellum: Great amount of congestion of blood vessels. Round cells in great numbers surround the walls but do not infiltrate them. There are several areas of degeneration in the section. Pons: Marked congestion. Motor cells only faintly stained. Many small areas of degeneration. Medulla: Marked congestion. Many punctate haemorrhages throughout section. Numerous round cells dot the tissue. A few small degerated areas are seen. Motor cells are abundant and clearly stained. Cord: Motor cells in the gray matter intact. A great many round cells are scattered throughout gray matter but not in such a way as to indicate poliomyelitis. Vessels are congested and several degenerated areas of small size are seen.

Monkey No. 44. 4-21-11, etherized and injected intracerebrally with 3 c. c. emulsion glycerinated cord Monkey No. 35. 4-9 11, very weak and sick. 4-10-11. Died. No abscess or tumor in brain or cord. Tubercles on the meninges of the brain. Precaseous tubercles in the lungs, liver and spleen. Bronchial glands greatly enlarged and cheesy.

Monkey No. 44. 4-21-11, etherized and injected intracerebrally with 3 c. c. of the mixed filtrates of emulsions of cords of Case No. 53 (Human) and of Monkeys Nos. 30, 32, 35, 38 and 41. 4-22-11, palsy of right leg and arm due to pressure. Otherwise well and lively. 4-25-11. Hair ruffled, irritable. Blood shows organism in stained smears and fresh preparation. 5-2-11, Vomiting and diarrhoea. 5-3-11, shaky. Still some diarrhoea, but no vomiting. 5-4-11, right and left leg paralyzed completely. Still has good use of arms. 5-5-11, neck twisted to right. 5-7-11, right arm paralyzed. Eyes bright and eats well. 5-8-11. Same condition. 5-9-11, chloroformed: brain and cord removed. Appearance on section normal. Pieces of all parts of C. N. S. preserved for histological examination, remainder preserved in 50 per cent. glycerine for virus.

Histological notes : Cerebrum: Pia almost entirely absent. Nervous tissue normal. Perivascular spaces wide. No haemorrhage from vessels into nervous tissue. No round cell infiltration around vessel walls or elsewhere. Cerebellum: Vessels of gray and white matter injected. No round cell increase around vessel walls or elsewhere. Pons: Vessels injected. Walls infiltrated with round cells. Nervous tissue normal. Medulla: Vessels injected and their walls markedly infiltrated with round cells. There seems to be a small area of necrosis around the dentate nucleus in the left anterior portion of the medulla. The motor cells appear perfectly normal. Cervical cord: Walls of vessels of white and gray matter markedly infiltrated with round cells. Vessels themselves are injected. There is not much round cell increase in the gray matter, although in one or two places in the anterior horns the motor cells seem to be displaced by round cells. Lumbar Cord: Vessels congested and the walls infiltrated with round cells. Round cells are scattered in great numbers throughout the gray matter, and in the anterior cornua they have so massed themselves that only a very few motor cells are visible.

Monkey No. 45. 4-22-11. Injected into brain 3 c. c. of an emulsion of cord, pons, bulb, cortex and cerebellum of Monkey No. 42. Recovered nicely from operation. 4-28-11, sick and weak. 4-29-11, weaker but no paralysis. 5-1-11, very weak and emaciated, gradually becoming weaker. 5-4-11, disinclination to use right arm. 5-7-11. Died without paralysis. Brain and cord removed. Membrane of brain and cord congested. Brain cortex injected very much. Sections of C. N. S. preserved in 4 per cent. formaldehyde for histological examination. Remainder kept for virus in 50 per cent. glycerine. Internal organs showed a generalized tuberculosis.

Histological Notes: Pial vessels congested and walls infiltrated with round cells. Vessels of gray and white matter also congested and the walls of many of these show a round cell increase. Cerebellum: Vessels of pia congested and their walls are slightly infiltrated with round cells, vessels of nervous substance congested but there is no infiltration of round cells. Nervous substance normal otherwise. Pons: Vessels in all parts of section congested. Round cell increase is marked in the walls of the pial vessels. Slight infiltration of the walls of the vessels of the tegmentum. Bulb. Motor cells intact. Vessels of gray matter congested. An increase in round cells is found in the walls of some of these vessels. Quite an aggregation of round cells is seen in one of the posterior columns of the white matter of the cord. Vessels of pia congested. Cord: Motor cells intact. Pericellular spaces distended. Vessels of gray matter congested but no round cell infiltration of their walls. In the walls of one vessel were seen several curved rod shaped organisms which looked much like the organism used to inoculate Monkey No. 42, the emulsion of whose cord was used to inoculate this monkey No. 45.

Monkey No. 46. Control for monkey No. 47. 5-13-11, etherized and injected intracerebrally with 3 c. c. salt solution emulsion of glycerinated cord of Monkey No. 44. 5-15-11. Sick. 5-16-11, still sick but eats well. Trembling and weak, but spirited. 5-18-11. Wabbly but no paralysis. 5-19-11. Paralyzed in legs and right arm. Still has use of left arm. Eyes bright. No paralysis of head or neck muscles. 5-20-11, left arm paralyzed. Helplessly lies on side. Chloroformed, brain and cord removed. Normal in appearance, internal organs normal. Sections of all parts of C. N. S. placed in 4 per cent. formaldehyde for histological examination. Cord and part of brain preserved for virus in 50 per cent. glycerine.

Histological Notes: Cerebral cortex: Pia and brain matter normal, except that the blood vessels show congestion. There is no round cell increase. Cerebellum: Normal except a moderate congestion of blood vessels. Pons: Pia absent. Pontine cells intact. A slight round cell increase throughout the tegmentum. Marked round cell infiltration in vessel walls. Perivascular spaces not enlarged. Medulla: There is an absence of pia. Motor cells intact. Round cell infiltration is present throughout the gray matter. Blood vessel walls are packed with round cells. Perivascular spaces are not enlarged. Cervical cord: Round cells remarkably increased throughout the gray matter, almost entirely replacing the motor cells in the anterior horns. The vessels are infiltrated but not so much so as in the sections of pons or medulla. Lumbar Cord: Shows same changes as cervical portion, with the addition of a small haemorrhage into the left anterior horn.

Monkey No. 47: Etherized 5-13-11. Injected into the brain 3 c. c. emulsion of glycerinated cord of Monkey No. 44. Also given 1 c. c. 2 per cent. formaldehyde into spinal canal in lumbar region. 5-16-11. Died. Internal organs normal, except for rather marked congestion in right lung. At site of inoculation in the brain was found an area of necrosis about the size of a quarter dollar caused by non-absorption of the virus. Death due to the effects of formaldehyde.

Monkey No. 48. Etherized and injected into brain 3 c. c. emulsion of cord of Monkey No. 45, 5-13-11.

May 14, 1911, this animal died. Probably from shock of operation.

Monkey No. 49. 5-29-11, etherized and injected intracerebrally with 3 c. c. of an emulsion of cord of Monkey No. 46. On the 8th day this animal came down with paralysis of the right arm. 1 c. c. of a 1 per cent. solution of formaldehyde was injected into the spinal canal in the lumbar region, with the hope that this injection would stop the progression of the paralysis. This did not occur, however, inasmuch as on the next day the animal's right leg became paralyzed and on the following day his left leg. Then he became paralyzed in all his members. Found rod shaped poliomyelitis (?) organisms in specimen of fresh blood from this animal.

Histological Notes: Cerebral cortex. Pia absent, gray and white matter normal. No round cell increase any where. Cerebellum: Pia absent. Nervous substance normal. Pons: The perivascular spaces are large and the vessels are filled with blood. The vessel walls are infiltrated with round cells. Medulla: Pia negative. Round cells infiltrate the vessel walls and even fill up the lumina. No increase of round cells in nervous substance. Pons: Pia absent. In the left anterior horn there are seen only three or four motor cells, the others are displaced by round cells. In the right anterior horn there has occurred a haemorrhage though most of the motor cells are intact. The walls of the vessels throughout the gray matter are infiltrated with round cells.

Monkey No. 50. 5-29-11. Etherized and injected 3 c. c. of the filtrate of the cord of Monkey No. 46, intracerebrally. 5-31-11. Injected 1 c. c. of a 2 per cent. solution of formaldehyde into the spinal canal. 6-2-11 Injected 1 c. c. of a 2 per cent. solution of formaldehyde into the spinal canal. Monkey died in 30 minutes, first from a rapid paralysis of the limbs, then of diaphragm, and finally of heart muscle. Artificial respiration was continued for 30 minutes before death ensued, in the hope of saving the animal. Death was due to the paralyzing effect of the formaldehyde itself.

Monkey No. 51. 5-29-11. Etherized, injected 3 c. c. filtrate of emulsion of cord of Monkey No. 45 into the left frontal region. 6-6-11, disinclined to use left arm, though can do so if required. 6-8-11, no change. 6-10-11, lively and well. No paralysis occurred. On 7-6-11, the animal was given 10 c. c. of an emulsion of the cord of Monkey No. 49 by means of the stomach tube. 8-2-11, well. 9-10-11, died of generalized tuberculosis.

Monkey No. 52. 7-19-11. Injected into right frontal lobe of brain 3 c. c. emulsion of glycerinated cord and pons of Monkey No. 49. Under same etherization injected into right femoral vein 5 c. c. of a 1 per cent. solution of formaldehyde. Animal recovered nicely from operation. 7-24-11, injected 5 c. c. of 1 per cent. formaldehyde solution into left femoral vein. 7-31-11, nervous and irritable, hair ruffled, trembling, some incoordination, but no paralysis. 8-1-11, both arms and both legs paralyzed. 8-2-11, animal lies helpless, no extension of paralysis to head or neck muscles or to muscles of tail. Chloroformed. Brain and cord removed. Sections placed in 4 per cent. formaldehyde and in 50 per cent. glycerine. Organs of thorax and abdomen normal.

Histological Notes: Cerebral cortex: Pia normal. Vessels full of blood, perivascular spaces a little enlarged. In white and gray matter no other change is noted. Cerebellum: Vessels congested, otherwise normal. Pons: Pia normal. Pontine cells intact. Vessels congested and their walls filled wtih round cells. Medulla: What remains of pia appears normal. Vessels of gray matter congested and their walls infiltrated with round cells. Motor cells intact. Cervical cord:

Moderate round cell increase in pia as it passes within the anterior median fissure. Blood vessels throughout section congested. Round cell infiltrate throughout gray matter of cord. In anterior horns of gray matter the motor cells are almost entirely missing. The walls of the vessels in gray and white matter are filled with round cells. The lumina of some of those in the white matter appear entirely choked. Lumbar cord: There are a few more motor cells in the anterior horns than appear in the cervical cord section, though the round cell increase in the gray matter is more marked, otherwise the same changes as appear in the cervical cord are noted.

Monkey No. 55. 8-19-11. Injected intracerebrally with 5 c. c. bouillon culture of poliomyelitis (?) organism isolated from blood of a case of poliomyelitis. 8-21-11, left side paralyzed, due to intracranial pressure. 8-24-11, use of left arm regained, leg still paralyzed. By 10-2-11, the palsy was not at all noticeable. 10-5-11, injected subcutaneously with 2 c. c. bouillon culture of organisms of poliomyelitis (?) isolated from blood of Monkey No. 32; again on the 6th and again on the 7th. 10-10-11, injected intracerebrally with 1 c. c. of virus of Monkey No. 56. This was done in order to test immunization power of culture. 11-1-11, no paralysis developed from the previous injection of virus, and on this date 1 c. c. of an emulsion of the cord, pons and bulb of Monkey No. 60 was injected intracerebrally. 11-8-11 paralysis of left arm. Animal seems in pain for he screams when one goes near cage; very irritable. 11-9-11, paralysis of both legs, breathing difficult. Chloroformed. Spinal puncture made and some spinal fluid withdrawn. Blood taken from heart in Pasteur pipette. Organism found in fresh blood. Culture made of blood and spinal fluid. Brain and cord removed and sections of each part put in 4 per cent. formaldehyde and in 50 per cent. glycerine. Organism of poliomyelitis (?) was beautifully seen in the fresh blood. Stained smears showed the organism. A diphtheroid rod, a cladothrix, and a diplococcus were isolated from the blood. A leptothrix and a diphtheroid rod were isolated from the spinal fluid.

Histological Notes: Cerebrum: Blood vessels congested, perivascular spaces widened. A small haemorrhage is seen in one part of the cortex, otherwise no change. Cerebellum: Congestion and enlargement of the perivascular spaces. Pons: On one side of the pons in the tegmental portion many motor cells are seen, while on the other side there are very few and there is quite a marked increase in round cells in this region. Round cells infiltrate all the vessel walls. Medulla: The gray matter is pretty well infiltrated with round cells throughout. Many of the motor cells are lacking and the walls of the blood vessels are filled with round cells. Cervical Cord: Only five or six motor cells are seen in the anterior horn. The places of the motor cells are filled with round cells. The gray matter as a whole shows a marked increase in round cells; the walls of the vessels are markedly infiltrated. Lumbar cord: Same changes as seen in cervical cord.

Monkey No. 56. 8-17-11. Injected subcutaneously with 2 c. c. of filtrate of an emulsion of the cord of Monkey No. 5 (immunity monkey). On 8-19-11 and 8-21-11, injections of the same material, in the same dosage, and administered in the same way were given. 9-1-11, injected 1 c. c. virus Monkey No. 52, into left parietal lobe of brain. 9-6-11, very irritable. 9-7-11, paralysis of left leg. 9-9-11, palsy of right leg not complete paralysis. 9-11-11, some loss of power in left arm, otherwise same condition as on 9-9-11. Given this day and on the next succeeding day subcutaneously 3 c. c. serum of Monkey No. 35. Condition remained the same until 10-3-11, when complete paralysis of right leg occurred. He was killed and blood taken from heart for serum. Brain and cord removed for section and virus.

Histological Notes: Cerebral Cortex: A few small hemorrhages into the gray matter, otherwise normal. Cerebellum: Normal. Pons: Pontine cells intact. An increase in round cells throughout, especially marked around the blood vessels. Medulla: An increase in round cells throughout gray matter and a marked infiltration of the vessel walls with round cells. Cervical cord: Great masses of round cells have obliterated most of the motor cells on one side of the gray matter. In the anterior and posterior horns on one side more motor cells are to be seen than in the corresponding areas on the other side. The vessels are completely choked with round cells. Lumbar Cord: There are a few multipolar ganglion cells to be seen in the right anterior horn. The gray matter thorougout is heavily infiltrated with round cells, especially the anterior horns and the blood vessels are lined with them.

Monkey No. 57. 8-17-11, injected under the skin with 2 c. c. serum of Monkey No. 35. 8-19-11 and 8-21-11, injected in the same way with the same quantity of the same material. 9-1-11, injected into brain 1 c. c. emulsion of cord and bulb of monkey No. 52. Monkey recovered nicely from operation. He never developed paralysis or any other symptoms of polioymelitis. 1-15-12 died of pneumonia.

Monkey No. 58. 10-19-11, inoculated intracerebrally with 1 c. c. normal saline emulsion of Cord of Monkey No. 52. 10-29-11, left leg paralyzed. Nervous and irritable. 10-31-11, both legs paralyzed. Paralysis progressed no further. 11-7-11, animal chloroformed. Brain and cord removed and emulsion of this cord inoculated into Monkey No. 62, in order to keep up strain of virus. This Monkey No. 58 was a control monkey for Monkey No. 57.

Histological notes: Cerebrum: No change. Cerebellum: No change. Pons: Slight amount of round cell infiltration in blood vessel walls, otherwise normal.

Medulla: There are a few vessels whose walls contain an excess of round cells. There seems to be no round cell increase in the gray matter. The pericellular spaces are enlarged as though the tissue were somewhat oedematous. A few very slight hemorrhages are dotted here and there throughout the gray matter. Cervical Cord: In the anterior horns only a few motor cells are seen, their places having been taken by round cells. Near the roots of the anterior horns may spaces are enlarged as though the tissue were somewhat oedematous. A few still be seen some motor cells. The walls of the blood vessels throughout the gray matter are thoroughly infiltrated with round cells. No hemorrhages are seen. Lumbar Cord: In one anterior horn the vessel walls in many instances show a moderate round cell infiltration. The motor cells show no effect of the slight round cell increase in the gray substance. The structures of the other anterior horn show no change from normal. The walls of the vessels in one of the posterior horns corresponding to the anterior horn of the affected side show a round cell increase, whilst those of the other side appear normal.

Monkey No. 60. Inoculated intracerebrally 10-19-11 with 1 c. c. normal saline emulsion of cord (see next page). 10-27-11, right leg completely paralyzed. Great loss of power in left leg. 10-27-11, .2 c. c. of spinal fluid withdrawn, examined microscopically, planted in bouillon and plated. No poliomyelitis (?) organisms found in stained smears of spinal fluid. Several different organisms isolated by plating. Blood showed poliomyelitis (?) organism in fresh specimen, as well as in stained smears. 10-30-11, weakness of arms, no paralysis, however. 11-1-11, same condition. Chloroformed. Brain and cord removed. Emulsion of pons, bulb and cord injected into brain of Monkey 55. Sections of C. N. S. preserved in 4 per cent. formaldehyde and in 50 per cent. glycerine. No growth in bouillon of spinal fluid implantation. Diphtheroid rod isolated from plated spinal fluid. No organism isolated from blood.

Histological Notes: Cerebrum: An increase of the number of round cells in the walls of the blood vessels is here shown. No other change is noticeable. Cerebellum: Quite a marked degree of round cell increase is found throughout the gray matter, and especially is it marked in the blood vessel walls. Pons: Pontine cells intact. Increase of round cells in the tegmentum. Walls of all vessels infiltrated with round cells. Medulla: Motor cells are abundant throughout the gray matter. A round cell increase is noted in both gray and white matter. Round cells abound in the walls of the vessels, especially in the gray matter. Cervical Cord: In one anterior horn the motor cells are normal in amount with only a small round cell increase, while in the other one only a few motor cells are seen, exudate and round cells blotting them out. All the vessel walls show a round cell infiltrate, both in anterior and posterior horns. Lumbar Cord: Same changes as seen in the cervical portion.

Monkey No. 61. 10 24-11. Inoculated intracerebrally with 1 c. c. filtrate of emulsion of cord of Monkey No. 56. This to control No. 56 virus, which monkey No. 55 received. Animal remains well. 11-28-11, injected intracerebrally with 1 c. c. emulsion of pons, bulb and cord of Monkey No. 62. 12-4-11, withdrew .4 of a c. c. of spinal fluid. Made smear and plated. Only a few small diplococci found in stained smear. Withdrew 1 c. c. of blood, plated and cultured on egg media. Animal is very irritable to day, but no paralysis has occurred. 12-5-11, hair ruffled, suffused face and irritable. Paralysis of both legs. 12-6-11, paralysis of all members. Animal chloroformed. Sections of C. N. S. preserved in 4 per cent. formaldehyde and also in salt solution.

Histological notes: Cerebrum: Blood vessels congested. Tissue oedematous. No other change. Cerebellum. Moderate congestion, otherwise normal. Pons: Tissue heavily infiltrated with round cells. Vessel walls infiltrated, motor cells numerous but obscured greatly by round cells. Medulla: Round cell infiltration of vessel walls marked. Gray matter heavily infiltrated. Multipolar cells are numerous and well stained. Cord: Gray matter loaded with round cells displacing almost entirely the motor cells. Vessel walls are infiltrated and in many instances the whole lumen is plugged with round cells.

Monkey No. 62. 11-8-11. Inoculated intracerebrally with 1 c. c. emulsion of cord, bulb and pons of Monkey No. 58 to preserve strain. 11-17-11, left leg palsied—not complete paralysis. 11-18-11, both legs completely paralyzed. Eats well. 11-19-11, right arm paralyzed. Chloroformed. Spinal fluid withdrawn before death. Heart punctured and blood withdrawn in pipette and smears also made on slides. Brain and cord removed after death. Brain vessels seem slightly injected. Some slight meningitis of brain and cord. Otherwise normal. Sections of C. N. S. preserved in 4 per cent. formaldehyde for histological examination, and in 50 per cent. glycerine for virus. Poliomyelitis (?) organism found in fresh blood, though shorter than usual and few in number. Also found in stained blood smear. No organisms found in stained smear of spinal fluid. Spinal fluid planted in bouillon and plated on agar agar. Isolated a streptococcus, a diphtheriod rod and a diplococcus. Planted blood in bouillon and also plated on plain agar and Hiss's plate medium. Isolated diptheroid rod and streptococcus.

Histological Notes: Cerebrum: Nervous tissue elements normal. Moderate congestion with slight infiltration of vessel walls with round cells. Cerebellum: Slight congestion. Vessel walls heavily infiltrated. Many circumscribed areas of round cells in the gray substance. Pons: There is some haemorrhage into the tegmental area. Walls of vessels in tegmentum are all heavily infiltrated. Motor cells intact. Perivascular spaces are enlarged. Medulla:

Motor cells intact. Gray matter filled with round cells and vessel walls heavily infiltrated. Cord: Motor cells wiped out and round cells take their places. Vessel walls heavily lined in lumbar region. A few motor cells present in cervical cord.

Monkey No. 63. 11-8-11, inoculated into left femoral vein 2 c. c. of a 24 hour bouillon culture poliomyelitis (?) organism isolated from the blood of Monkey No. 32. 11-15-11, injected into right femoral vein 5 c. c. of a bouillon culture of the same organism. This monkey remained well. On 2-13-12, 2 c. c. of virus of Monkey No. 55 was injected into the brain. The animal died 2-17-12 of pneumonia.

Monkey No. 5. (Immunity monkey—cited for reference from 1910 report.) 11-5-10. Animal injected subcutaneously with filtrate of cord, bulb and pons of Monkey No. 12. The amount represents .00125 grams cord substance per c. c. 11-9-10 to 11-28-10 well. Increased dosage this day to .0025 gram. The beginning doses were given every other day until 11-28-10. The increase in dosage to .0025 gram was continued on alternate days from 11-28-10 to 12-16-10. It was then increased to .005 gram and continued every third day until 1-3-11. On 1-3-11 and 1-5-11, respectively, .01 grams were given and 1-7, 1-10-11 .02 grams were given. On 1-12-11 .04 gram, 1-14-11 .08, 1-17-11 .16 gram, 1-20-11 .25 gram, 1-23-11 .50 gram, 1-25-11 1.0 gram were given. The monkey remained well throughout treatment. On 2-14-11 animal was well and lively. He was etherized and inoculated intracerebrally with 3 c. c. emulsion of Cord of Monkey No. 30. No symptoms of poliomyelitis occurred. 3-24-11, bled monkey from femoral artery, but on account of high coagulability of the blood and low blood pressure could get only 15 c. c. of blood. Therefore the abdomen was incised and 70 c. c. of blood was withdrawn from the aorta, from which about 30 c. c. of serum was obtained. The animal was not allowed to come out from under the influence of ether but was killed. Organs were normal.

HISTORY OF THE MATERIAL USED ON MONKEY NO. 60; FROM CHILD A., AGED TWO YEARS.

Autopsy performed 10-18-11 and spinal cord brought to the laboratory same day. Part of cord sectioned for histological examination. Emulsion in .85 per cent. saline was made from cord and 1 c. c. injected into brain of monkey number 60. (See protocol.)

10-11-11 The baby was seized with vomiting and weakness in left foot. 10-12-11, temperature 102, vomiting continued. 10-15-11 coma developed. Reflexes on left side gone. No pain. No retraction of head or neck muscles. Died 10-17-11. Injected by undertaker with embalming fluid ten hours before autopsy was performed.

Histological examination of cord revealed a general increase of round cells in the gray matter, especially in the anterior cornua. Only a few motor cells are seen. The blood vessel walls were heavily infiltrated with round cells. The pia was markedly increased in thickness. A short gram negative rod and a diphtheroid rod and cladothrix and a large diplococcus were isolated from the spinal fluid.

POLIOMYELITIS IN CHILDREN.

Name.	Age.	Onset.	Blood taken.	Organisms in fresh blood.	Organisms in stained smears.	Isolated.
Mary DeL., ...	2½ yrs.	5-31-11	6-15-11	+	+	−
Willis J., ...	2 yrs.	6-11-11	6-20-11	−	−	−
Wm. D., ...	2 yrs.	6-15-11	6-22-11	+	+	−
Cord S., ...	4 yrs.	6-24-11	7-11-11	+	+	+
Anna W., ...	14 mos.	8- 3-11	8- 9-11	+	+	−
Eliz. F., ...	2 yrs.	7-23-11	8-14-11	+	+	−
Eleanor G., ...	21 mos.	8- 4-11	8-18-11	+	+	−
Mary B., ...	......	8-13-11	8-23-11	−	+	−
Robt. W., ...	......	8-18-11	8-23-11	+	+	−
Anna H., ...	......	8-18-11	8-26-11	+	None sent	−
Rosie C., ...	14 mos.	8-17-11	9-24-11	None.	None.	−
Ardeo M., ...	4 yrs.	10- 7-11	10-11-11	+	−	Diphtherioid rod +.
Pauline R., ...	6 yrs.	10-25-11	11- 2-11	+	+	Only cladothrix isolated.
Alvan B., ...	6 yrs.	10- 9-11	11- 2-11	+	+	Diplococcus, diphtherioid rod +.
Althea P., ...	6 yrs.	10- 2-11	11- 2-11	+	+	Diphtherioid rod +.
Mabel W., ...	3 yrs.	11- 3-11	11-19-11	+	Poor smear	Short round end rod, streptococcus, leptothrix, diplococcus diphtherioid rod +.

MICRO-ORGANISMS FOUND IN THE BLOOD OF ACUTE CASES OF POLIOMYELITIS.

Preliminary Report.

In examining the blood from acute cases of poliomyelitis in human beings and also in monkeys in which the disease was produced experimentally an organism was found, different in morphological characteristics from any heretofore described, which may or may not, on further investigation, prove to be the etiological factor in the causation of the disease. In blood smears, fixed in methyl alcohol for one minute and stained with carbol-thionin, the organism appears as a faintly stained blue rod with regular cell wall, about 10 microns long and about 8 microns in width, curved at an agle of sixty to seventy-five degrees at one end, occasionally at both ends. At times, the curved end is bulbous. Some of the organisms appear to have a very finely granular protoplasm when the highest amplification is employed. They may be discerned by means of a 4 m. m. dry objective but their characteristics are much more satisfactorily delineated under the 1-12 oil immersion lens. They are found free in the serum as well as within the body of the red blood cell.

The organisms do not retain the violet color when stained by the method of Gram but assume the color of the counter stain which, as generally used in this laboratory, is a very dilute solution of carbol fuchsin.

The bloods examined were from ten different cases of acute poliomyelitis in children and were taken during the epidemic of last summer and autumn, and from thirteen cases of the disease during the acute stage, which had been produced experimentally in as many monkeys.

Blood smears from three normal human beings were carefully examined and although the search for these organisms was diligently made, none were found. Smears were made from the bloods of thirteen normal monkeys with negative results. After inoculation with the virus these same monkeys gave positive results. The blood of other normal monkeys gave negative results.

Blood smears were stained with iodine and sulphuric acid in order to test the organisms for cellulose, but no blue stained organisms were seen.

Smears from the cords and brains of paralyzed monkeys, and from one human case were examined, but none of the new organisms were found.

Filtered virus stained with carbol-thionin and by Gram's method showed none of these organisms.

Defibrinated blood, three weeks to two months old from two paralyzed monkeys showed the forms in increased numbers.

Cultures made from the blood of a paralyzed monkey, in blood bouillon, plain bouillon, and blood agar, examined after having been inoculated three weeks, showed the presence of the organism in increased numbers. Dorsett's egg medium was inoculated with the same blood at the same time but the organism was not found in smears from the surface of the medium or from the water of condensation.

We have searched without success for moving organisms in fresh blood, in old tubes of defibrinated blood from paralyzed monkeys, in blood bouillon, plain bouillon, serum bouillon cultures three weeks old and in the condensation water in three weeks old cultures on Dorsett's egg medium under dark field illumination.

Success in isolating the organisms has not attended our efforts as yet.

MICRO-ORGANISMS FOUND IN THE CIRCULATING BLOOD OF ACUTE CASES OF POLIOMYELITIS.

Since our preliminary report of the finding of a rod shaped micro-organism, curved at one or both ends, one end or both of which may be bulbous, in specimens of stained blood taken from human beings suffering from Poliomyelitis and from monkeys in which the disease had been produced experimentally, these micro-organisms have been found free in the serum or attached to the side of a red blood corpuscle in fresh blood taken from three monkeys ill of poliomyelitis. The monkey blood was examined at the time of inoculation and at

24 hour periods up to 168 hours after inoculation. In the blood examined at the time of inoculation and at the end of the first 24 hour period no organisms were found. At the end of 48 hours, however, a few of the micro-organisms were found. Their numbers in the fresh blood specimens increased up to 120 hours after which time they seemed to appear in about the same numbers till examination at regular intervals was discontinued. At the end of three weeks the organisms could still be found in large numbers in the fresh blood.

The blood of a normal monkey examined at the same period, as a control, failed to reveal any of the micro-organisms.

The motility was of a slow sinuous type resembling that of a spirillum. The bulbous ends were readily discernable. At times the organisms appeared as standing on end presenting the bulb uppermost so that it resembled a large coccus in the microscopic field. Presently it would right itself and the long curved rod terminating in this bulb could be distinctly followed.

Pure cultures of an organism in many ways identical in morphology with the foregoing were isolated from the bloods of these three monkeys, on a medium made of the central nervous system of a monkey combined with agar-agar. After a generation or two on this central nervous system agar, the organism grows well on the ordinary media.

The morphological, biological, and biochemical characters of the organism grown on artificial media are as follows:

The best stain to bring out the morphology is carbol thionin though Loeffler's alkaline methylene blue, Giemsa, Wright's Ziehl-Nielsen carbol fuchsin and Gram's method demonstrate the organism with no difficulty whatsoever. Stained with carbol thionin the organism apears as a granulated rod, the young forms measuring .6 to .8 microns in width by 1 to 2 microns in length. The older forms may appear as long as 10 or 12 microns with a width of .6 to .8 microns. Many of the indeterminate forms appear as spirals with from 2 to 4 loose turns. The longer forms have in many instances bulbous ends which have somewhat the appearance of spores, though no free spores have ever been observed.

The organism is slightly motile, having a single polar flagellum at one pole only. It has no demonstrable capsule, and it is decolorized by the method of Gram. Colonies on agar are circular, moist, convex, entire, 1 to 3 mm. in diameter. In color they are bluish gray by direct light, old colonies having a yellowish tinge by transmitted light. Their peripheries are translucent while their centres are thickened and appear yellowish white. Microscopically they are brownish white, with a finely granular translucent periphery, and an opaque brown, grumous centre.

Agar slant—Bluish gray with a suggestion of greenish tinge in cultures 3 or 4 days old, moist, raised, regular edges, growth along whole length of streak. White beaded growth in stab.

Gelatine—White, beaded growth along needle track with nail head moist growth on surface. No liquefaction.

Potato—Moist, cream to brown, abundant.

Central nervous system agar—Gray, moist, very abundant along entire path of inoculation.

Egg medium, consisting of yolk only—Moist, very abundant, spreading, pinkish growth.

Bouillon—Very turbid, white flocculent sediment. In 120 hours a white ring around the glass tube at the level of the surface of the medium.

Litmus milk—An initial acidity followed by a gradually increasing alkalinity with a beginning reduction of the litmus at the bottom of the tube. No coagulation of the casein occurs. In four weeks acidification again takes place, reduction of litmus and firm coagulation after 5 weeks.

There is a slight production of acid in dextrose and saccharose agar, but not in mannite, maltose, or lactose. Gas production does not occur in any of the sugars above mentioned. Mannite turns green after three weeks. The organism grows best in neutral medium, next best in acid, and most poorly in alkaline.

Indol is not produced. It seems to grow most abundantly on media rich in phosphates. It does not grow well on media containing much glycerine. The organism grows in the absence of air as well as when the air is given free access.

V. THE OCCURRENCE OF TUBERCLE BACILLI IN THE URINE OF PATIENTS SUFFERING FROM PULMONARY TUBERCULOSIS.

It suggested itself to me while making routine bacteriological examinations of urine and sputum in the Laboratories of the Pennsylvania Department of Health, that it might be interesting to determine in what percentage of cases of Phthisis Pulmonalis, tubercle bacilli occur in the urine.

The line of investigation pursued led me to divide these cases into four groups. According to the presence of these microorganisms: first, in the urine alone; second, in both sputum and urine; third, in the sputum but not in the urine; fourth, in neither sputum nor urine.

The sputum and urine from 100 cases diagnosed as pulmonary tuberculosis by competent physicians of large experience in the diagnosis of pulmonary diseases, at the two Philadelphia Dispensaries for the treatment of tuberculosis maintained by the Pennsylvania Department of Health, and at the Dispensary of the Rush Hospital for Consumptives, form the material on which I have based this report. The method followed for the determination of the presence of the tubercle bacillus in the urine was this:

The specimen was centrifugated until as much of the solid matter as possible was thrown down, supernatant fluid then being poured off, the sediment, after the manner of E. Trevethick of London, (see Brit. Med. Jr. 1904, I. p. 13) was washed in sterile distilled water and centrifugated again, in order to dissolve the mucus and urinary salts which very often obscure the presence of the bacillus. This centrifugation, pouring off the supernatant fluid, and washing of the sediment was twice repeated.

The sediment was then spread over the surface of two clean slides and allowed to dry in the air. After fixation by heat, they were stained for ten minutes in hot Ziehl-Nielsen carbol-fuchsin, the superflous stain drained off and one slide was immersed in a saturated solution of methylene blue in absolute alcohol, the other in Pappenheim's solution over night for the purpose of decolorization and counter staining.

The slides were then washed in water, dried and examined under the oil immersion lens.

There are three species of bacteria of the acid fast type rather frequently found in the sputum and urine, from which it is advisable to differentiate the tubercle bacillus. These are the timothy or hay bacillus, the butter bacillus, and the smegma bacillus.

The timothy bacillus is a good deal larger than the tubercle bacillus and frequently shows branched forms. The alcohol resisting power of the previously stained organism is also much less than that of the B. tuberculosis, and the likelihood of its presence is much less in urine than in sputum.

The bacillus butyricus, or butter bacillus, isolated from butter and milk by Petri, Rabinovitsch, Korn, and others, possesses only a slight degree of acid fastness and is therefore easily differentiated by the use of Pappenheim's rosolic acid-alcohol solution.

The smegma bacillus is the one which gives us most concern in its differentiation in B. tuberculosis in the examination of urine sediments.

Bunge and Trautenroth recommend decolorization with 5 per cent. chromic acid for 15 minutes, sulphuric acid 16 per cent. for 3 minutes and a concentrated alcoholic solution of methylene blue for 5 minutes for differentiation.

Coles, in the Journal of State Medicine, 1904, (p. 212) states that smegma bacilli resist Pappenheim's solution for four hours, tubercle bacilli for 24 hours and other acid alcohol fast bacilli for only two hours.

Francis Carter Wood of Columbia University, highly recommends Pappenheim's solution for the differentiation of B. smegmatis and B. tuberculosis. His method is to pour the Pappenheim's on the stained slide, drain off slowly and repeat five times.

Many authors consider absolute alcohol sufficient in itself as a decolorizer and agent in differentiation.

In our hands it has worked quite as satisfactorily as Pappenheim's solution, inasmuch as the differentiation between B. smegmatis and B. tuberculosis depends more upon the lessened ability of the smegma bacillus to retain the carbol fuchsin stain in the presence of strong alcohol, rather than in the presence of acid.

The occurrence of B. leprae in the urine of tuberculosis patients in this country is so improbable that it was thought to be hardly worth while to mention it as a organism from which to differentiate the tubercle bacillus.

In a number of instances I allowed the centrifugated sediment of the specimen to be digested over night in the incubator with an equal volume of 0.6 per cent. solution of sodium carbonate. In the morning this was centrifugated, the overlying liquid poured off and an equal volume of sodium hydroxide (0.25 per cent. sol.) was mixed with the sediment and allowed to stand for fifteen minutes. The process of centrifugation, decantation and washing of the sediment with distilled water three times is carried out, and the sediment spread on two slides, and stained as above described. Antiformin was also used as a digestant with a few specimens. I found, however, that no better results were given by digesting them than in control specimens which were centrifugated and simply washed several times with sterile distilled water.

Sturm, whose paper on "Tubercle Bacilli in the blood and urine" published in the Beiträge zur Klinik der Tuberculose and abstracted in the Journal of the American Medical Assoc. vol. 58, p. 70, states that he found tubercle bacilli in 50 per cent. of the series of 50 cases of tuberculous men examined by him.

In my series of cases, in which tubercle bacilli appeared in the urine alone, there were five.

The number in which they appeared in both sputum and urine was six. The organisms occurred in the sputum but not in the urine of 48 cases; and were present neither in the sputum nor the urine of 41 cases.

In summing up in order to compute the percentage of cases of pulmonary tuberculosis, in which tubercle bacilli occurred in the urine, we must take into consideration only those wherein the organisms were found in the urine alone, and in both sputum and urine. This number was 11. In other words, the result of the examination of the urines of 100 tuberculous individuals with active pulmonary lesions showed that in only 11 per cent. could tubercle bacilli be demonstrated in the urine.

We do not know whether Sturm's percentage of positive findings was arrived at only by examination of the stained preparation of the sediment under the microscope, or whether inoculation of animals with some of the sediments in which tubercle bacilli could not be found by microscopic examination, was resorted to.

It seems very probable, however, that if animal inoculations with the sediments of urines in this series of cases, the stained preparations of which failed to reveal tubercle bacilli on microscopic examination, had been made, the percentage of positive results would have been somewhat higher.

VI. EXPERIMENTS ON THE ETIOLOGY OF SCARLET FEVER.

Experiments to confirm results of Dr. Vipond of Montreal.

Swollen lymphatic glands aspirated with sterile hypodermic needle.

Fluid, if any, planted on blood serum and glucose agar.

Incubated at 37° C. for 24 hours.

Material at Municipal Hospital, Phila., collected by permission of Dr. Samuel Woody, Chief Resident Physician, and assisted by Dr. Witmer.

Case 1. A. S., Sept. 5, 1911, 13th day of disease. Material from left side—swollen glands at angle of jaw. Planted on blood serum. Transplanted on glucose agar after 3 hours at 20° C.

9-7-11. Blood serum tube contains a few rod shaped bacteria—single and in twos, $1\frac{1}{2}$ x $\frac{3}{4}$ microns with rounded ends. Agar culture shows a rod shaped organism arranged in short chains—with spores.

Case 2. J. S., 16th day day of disease. Material from swollen glands at angle of jaw.

9-7-11. A. Left side. Blood serum culture shows two small colonies—micrococcus.

B. Right side.

9-6-11. Blood serum culture shows a diplococcus.

9-9-11. Agar culture shows micrococcus.

Planted on blood serum transplants—A on glucose agar. B on plain agar after 3 hours at 20° C. The bacteria found in the blood serum culture (No. 1) were planted in different media.

Labeled—1-B. 9-8-11.
Glucose agar.
Saccharose agar.
Lactose agar.
Maltose agar.
Mannite agar. No growth.
$CaCO_3$ gluc. bouil.
Plain bouillon. (Blood serum tube had contained dead bacteria.)
Peptone.
Milk.
Blood serum.

The bacteria found in the agar cultures (No. 1) were also inoculated into different media.

Glucose agar	No gas.	9-12-11.
Saccharose agar	Ac. no gas.	
Lactose agar	Ac. no gas.	
Maltose agar	Ac. no gas.	
Mannite agar	Neut. gas.	
$CaCO_3$ gluc. bouil	No gas—Pellicle.	
Plain bouil.	Pellicle.	
Peptone	Pellicle—No indol.	
Milk	Ac. coag. Digest.	
Agar	Whitish—Spreading.	

Culture 1 Ag. which is a spore forming rod—non motile (?)—does not correspond to Vipond's organism, because it forms no gas in sugar media, nor does it form indol in peptone. It also digests casein and blood serum, and no doubt gelatine, though this was not tried.
9-16-11.

Case No. 3. Lymph gland kindly furnished by Dr. Kolmer, taken from fatal case of scarlet fever. (Municipal Hosp.)
Smears: Stained with methylene blue show streptococci and a rod shaped organism—occurring singly and in pairs; the latter is probably a contamination as it did not develop in the cultures.

Cultures:
Blood serum—Shows streptoccus.
Egg Medium—Shows streptococcus.
Glucose Agar—Shows staphylococcus.

Gland preserved in alcohol for histologic study.
The sections show acute lymphangitis. No organisms could be found.
Stains: Hematoxylin and eosin, also methylene blue.

9-27-11.
Dr. A. E. Vipond, 576 Dorchester St., West, Montreal, sent six cultures from patients with scarlet fever, as follows:
No. 1. Fred Ashe, 9th day of disease.
No. 2. Floyd Moffat, 3rd day of disease.
No. 3. Wm. Watson, 3rd day of disease.
No. 4. Gwen Butler, 6th day of disease.
No. 5. Louisa Davis, 20th day of disease.
No. 6. Anna Finkenstein, 16th day of disease.

These cultures were planted on plain agar, in lactose, saccharose, maltose, and mannite litmus agar, in milk, and in peptone solution.
All the cultures are spore formers—motile and Gram positive.
All the cultures show a gray spreading growth on agar with a fimbriate border.
Milk is slightly acidified, coagulated (soft) and digested rapidly. A pellicle forms on peptone solution. Acid formation in saccharose and maltose litmus agar media. No gas formation in any of the carbohydrates.

VII. AN EXPERIMENT TO DEMONSTRATE THE PRODUCTS OF COLON BACILLI AND ACID FAST ORGANISMS OF THE TUBERCLE BACILLUS MORPHOLOGY UPON APPLES, ORANGES, BANANAS AND LEMONS.

In order to discover whether the ordinary market fruit would be the carrier of the organisms mentioned in the title, fruit was bought in retail stores, washed in freshly distilled water, and handled as indicated in the detailed experiment given below. Experiments of this sort have been done three times, once with a whole bunch of bananas, once with bananas and apples, once with apples, oranges and lemons. At the time the experiments were made grapes were not available. This fruit is to be investigated. We have chosen the available fruits, the outer surface of which would be apt to come in contact with the hands and mouth of people eating them. The experiments show that upon the fruit examined colon bacilli and acid fast forms of the tubercle morphology could not be found.

Three apples washed in 85 c. c. of freshly distilled water, water well mixed and 25 c. c. removed for examination for the colon bacillus. 60 c. c. allowed to sediment in tubes for four days with a small amount of alcohol to reduce the specific gravity. Supernatant liquid removed, last 1 c. c. in each tube kept as sediment. These sediments were mixed and spread on two slides and stained in the usual manner for acid fast forms. None were found.

Two oranges washed in 100 c. c. of freshly distilled water, 25 c. c. removed for bacteriological examination for colon bacillus, and 75 c. c. allowed to sediment in tubes for four days with a small quantity of alcohol to reduce the specific gravity. Supernatant liquid removed, last c. c. in each tube kept as sediment. These sediments were mixed and dried on two slides and stained in the usual manner for acid fast forms. None were found.

Two lemons washed in 100 c. c. of freshly distilled water 25 c. c. re movedfor bacteriological examination for colon bacillus. 75 c. c. allowed to sediment in tubes for four days with a small amount of alcohol to reduce the specific gravity, last c.c. in each tube retained as sediment, which sediments were mixed and spread on two slides and stained for acid fast forms. None were found.

Examination for the colon bacillus was made as follows:

I received 25 c. c. of each water. With 5 c. c. I made five plates in litmus agar. No pink colonies appeared.

With the remaining 20 c. c. of each wash water I put 200 c. c. peptone medium. After 24 hours at 37° C. I took 0.1 c. c. of each and made dilutions of 1 to 10000.

After 24 hours at 37° C, I isolated 6 colonies of each plated dilution and investigated for B. coli.

RESULTS.

Apple	6 colonies	No B. coli
Orange	6 colonies	No B. coli
Lemon	6 colonies	No B. coli

After 48 hours the peptone culture was tested for Indol.

Lemon	Indol Reaction	+ Strong
Apple	Indol Reaction	+ Weak
Orange	Indol Reaction	0

In previous experiment the wash water was centrifuged in sterile containers at about 700 revolutions per minute for one hour.

Of the 25 c. c. wash water from the apples shake plates were poured from 2 portions of 1 c. c. each and 2 plates from 2 portions of 2 c. c.

each, the remaining 19 c. c. were planted in bouillon allowed to incubate for 25 hours and ten 1 c. c. samples plated on litmus lactose agar for the colon bacillus. None were isolated.

Of the 25 c. c. of wash water from the lemons shake plates were poured from 2 portions of 1 c. c. each and 2 plates from 2 portions of 2 c. c. each, the remaining 19 c. c. were planted in bouillon allowed to incubate for 25 hours and ten 1 c. c. samples plated on litmus lactose agar for the colon bacillus. None were isolated.

Of the 25 c. c. of wash water from the oranges shake plates were poured from 2 portions of 1 c. c. each and 2 plates from 2 portions of 2 c. c. each, the remaining 19 c. c. were planted in bouillon allowed to incubate for 25 hours and ten 1 c. c. samples planted on litmus lactose agar for the colon bacillus. None were isolated.

The Division of Distribution of Biological Products.

HENRY W. PEIRSON, *Chief*.

⁂

THE DIVISION OF DISTRIBUTION OF BIOLOGICAL PRODUCTS.

The Division of Distribution of Biological Products, Department of Health of the State of Pennsylvania, during the year 1911 conducted the distribution of four distinct products free to the indigent of the State as follows:—

First, the distribution of Diphtheria Antitoxin now furnished through the hands of 662 distributors, nearly all druggists, located at convenient points in each county throughout the entire State of Pennsylvania except in the cities of Philadelphia and Pittsburgh. This was begun November 4th, 1905, when only 473 distributors were appointed.

Second, the distribution of Vaccine and Vaccine supplies, which was transferred from the general office to this division, January 27, 1909, and is now made upon requisition through the County Medical Inspectors of the Department of Health, for the poor in townships not of the first class and to poor charitable institutions when asked for during a local or general epidemic of smallpox, unless otherwise ordered by the Commissioner of Health in extreme cases.

Third, the distribution if what are known as Tubercle Bacilli Products, namely, Tubercle Bacilli Extract in dilutions from No. 1 to No. 10, inclusive, and Suspension of Dead Tubercle Bacilli in dilutions from No. 1 to No. 10, inclusive, was begun June 29, 1909, and are furnished by the Department upon requisition of the physicians-in-charge of the 115 tuberculosis dispensaries located in the different counties of the State. On August 4th, 1910, however, the number of dilutions used in the treatment of tuberculosis was increased by the additions of dilutions No. 11 to No. 16, inclusive, in both the Extract and Suspension and since that time the number of dilutions in the Extract increased to No. 20, and these have been quite extensively used during the year 1911 at the Pennsylvania State South Mountain Sanatorium at Mont Alto, Franklin County, Pennsylvania, as well as by the physicians in charge of the 115 dispensaries located throughout the State in the treatment of tuberculous patients.

Fourth, the distribution of Tetanus Antitoxin through 67 Distributors located at different points in nearly all the counties throughout the State, except the cities of Philadelphia and Pittsburgh. This was begun July 4th, 1911. In this connection it may be well to state that the reason for the small number of tetanus antitoxin distributing stations as compared with the number of those for diphtheria antitoxin is because tetanus antitoxin if procured within 48 hours after injury, is effective, and the tetanus stations are so located as to be accessible from nearly every locality in the State within 24 hours.

Notwithstanding the fact that each year since the establishment of the distributing stations for diphtheria antitoxin among the indigent in 1905 additional stations have been established, 1911 brought with it a demand for more antitoxin stations, and the Commissioner of Health, after careful investigation and consideration found it possible owing to lack of funds, to establish but six more stations, a smaller increase than was made in any one year, except 1910, and bringing the total number, December 31st, 1911, up to 662.

The outline map inserted to the right shows the counties of Pennsylvania with the names and locations of the 662 distributing stations. The list of distributors is given in the general report of The Commissioner of Health on pages 35-43.

DIPHTHERIA ANTITOXIN 1905-1911..

The establishment of distributing stations for the distribution of diphtheria antitoxin among the indigent in the State of Pennsylvania and the appointment of distributors began November 4th, 1905, when 473 distributors were appointed at convenient places, most of them being duly registered druggists. Some antitoxin was distributed, however, in October, 1905, before any distributors were appointed. In 1906, the number was increased to 511; in 1907, to 529; in 1908, to 569; in 1909, to 650; in 1910, to 656, and in 1911, to 662.

From the date of the beginning of the distribution of diphtheria antitoxin to the indigent throughout the State of Pennsylvania by the Department of Health, in October, 1905, up to and including December 31st, 1911, thirty-five thousand one hundred and eleven (35.111) persons afflicted with diphtheria were treated for cure, of which number, only 2,834, or 8.07 per cent. resulted fatally. Reference to the diagram will show the percentage of deaths in these thirty-five thousand one hundred and eleven cases according to the duration of the disease in each twenty-four hours from the first to the sixth day, inclusive.

The following statement will show the number cured, the number of deaths, the total number treated and percentages of deaths for each year from 1905 to 1911, inclusive.

STATEMENT SHOWING RESULTS OF CURATIVE TREATMENT WITH DIPHTHERIA ANTITOXIN, 1905-1911, inclusive.

Years.	Number cured.	Number deaths.	Total treated.	Percentage of deaths.
1905,	255	38	293	12.97
1906,	3,136	393	3,529	11.14
1907,	4,895	376	5,271	7.13
1908,	5,794	542	6,336	8.55
1909,	4,949	416	5,365	7.75
1910,	5,965	559	6,524	8.57
1911,	7,283	510	7,793	6.54
Totals,	32,277	2,834	35,111	8.07

In addition to the number mentioned above that were treated for cure, twenty-seven thousand two hundred (27,200) persons, mostly little children, who were exposed to the disease were immunized, and of the number so immunized, only four hundred and eighty-two (482) contracted the disease, and of these, only 26 died.

The following statement will show the total number immunized, the number not developing diphtheria, the number developing diphtheria, the number of recoveries, the number of deaths, for each year from 1905 to 1911, inclusive.

STATEMENT SHOWING RESULTS OF TREATMENT FOR IMMUNIZATION FOR THE YEARS 1905 TO 1911, inclusive.

Years.	Number treated.	Number not developing diphtheria.	Number developing diphtheria.	Recoveries.	Deaths.
1905,	155	150	5	5	0
1906,	2,334	2,257	77	74	3
1907,	3,799	3,765	34	32	2
1908,	3,965	3,920	45	37	8
1909,	4,847	4,738	109	106	3
1910,	5,194	5,107	87	81	6
1911,	6,906	6,781	125	121	4
Totals,	27,200	26,718	482	456	26

The following statement will show the total number treated, the total number of deaths, the percentage of deaths in each twenty-four hours of treatment after onset of diphtheria, up to and including the sixth day and over, for each year from 1905 to 1911, inclusive.

STATEMENT

SHOWING RESULTS OF TREATMENT OF DIPHTHERIA ACCORDING TO PERIOD OF INITIAL TREATMENT AFTER ONSET, FOR 1905 TO 1911, inclusive.

	Results.	First day.	Second day.	Third day.	Fourth day.	Fifth day.	Sixth day and over.	Totals.
1905, ...	Total treated, ...	186	56	26	13	4	8	293
	Deaths, ...	18	9	3	3	2	3	38
	Per cent., ...	9.68	16.07	11.54	23.08	50.00	37.50	12.97%
1906, ...	Total treated, ...	2,105	902	302	107	52	61	3,529
	Deaths, ...	185	84	66	24	15	19	393
	Per cent., ...	8.79	9.31	21.85	22.43	28.85	31.15	11.14%
1907, ...	Total treated, ...	3,463	1,139	403	136	63	67	5,271
	Deaths, ...	159	100	55	32	11	19	376
	Per cent., ...	4.59	8.78	13.65	23.53	17.46	28.35	7.13%
1908, ...	Total treated, ..	3,979	1,464	540	162	103	88	6,336
	Deaths, ...	260	116	78	37	29	22	542
	Per cent., ...	6.53	7.92	14.44	22.84	28.15	25.00	8.55%
1909, ...	Total treated, ...	3,299	1,266	456	186	77	81	5,365
	Deaths, ...	124	128	75	38	24	27	416
	Per cent., ...	3.76	10.11	16.45	20.43	31.15	33.33	7.75%
1910, ...	Total treated, ...	4,155	1,437	560	196	84	92	6,524
	Deaths, ...	238	131	94	44	23	29	559
	Per cent., ...	5.73	9.12	16.78	22.45	27.38	31.52	8.57%
1911, ...	Total treated, ...	4,847	1,789	665	238	119	135	7,793
	Deaths, ...	151	145	93	62	26	33	510
	Per cent., ...	3.11	8.10	13.98	26.05	21.85	24.44	6.54%
Grand Total, ..	Total treated, ...	22,034	8,053	2,952	1,038	502	532	35,111
	Deaths, ...	1,135	713	464	240	130	152	2,834
	Per cent., ...	5.15	8.85	15.72	23.12	25.90	28.57	8.07%

The total number of packages of diphtheria antitoxin *supplied* to distributors up to and including December 31st, 1911, were forty-eight thousand one hundred forty-two (48,142) one thousand (1,000) units; sixty-eight thousand six hundred thirteen (68,613) three thousand units; and ten thousand four hundred twenty-four (10,424) five thousand (5,000) units; while the total number of packages actually *used* were thirty-two thousand nine hundred sixty-seven (32,967) one thousand (1,000) units; fifty-five thousand nine hundred nineteen (55,919) three thousand (3,000) units; and nine thousand two hundred twenty-one (9,221) five thousand (5,000) units; making a grand total of one hundred twenty-seven thousand one hundred seventy-nine (127,179) packages of diphtheria antitoxin *supplied* to distributors and of ninety-eight thousand one hundred seven (98,107) packages actually *used;* the difference, or twenty-nine thousand seventy-two (29,072) packages of 1,000, 3,000 and 5,000 units of antitoxin, being the stock in the hands of the 661 distributors located throughout the entire State.

The entire cost of the one hundred twenty-seven thousand one hundred seventy-nine (127,179) packages of antitoxin so supplied for the six years and three months was $121,668.36, as shown in the following statement by years:

Years.	No. of Packages.	Units.	Cost.
1905,	5,967	1,000 & 3,000	$ 7,251 80
1906,	12,108	1,000 & 3,000	16,192 32
1907,	14,154	1,000 & 3,000	17,387 13
1908,	18,210	1,000, 3,000 & 5,000	14,056 40
1909,	22,318	1,000, 3,000 & 5,000	16,565 52
1910,	24,264	1,000, 3,000 & 5,000	22,232 18
1911,	30,158	1,000, 3,000 & 5,000	27,983 01
	127,179		$121,668 36

Therefore, the total number of persons who were actually treated for cure together with those immunized, with the one hundred twenty-seven thousand one hundred seventy-nine (127,179) packages of diphtheria antitoxin distributed free to the indigent by the Department of Health in six years and three months, was sixty-two thousand three hundred eleven (62,311) mostly little children; and the total cost for the antitoxin supplied during these years was $121,668.36, or a per capita cost of about $1.95, surely a moderate sum for the results attained.

DIPHTHERIA ANTITOXIN, 1911.

The total number of cases treated among the indigent throughout the entire State for the year was 7,793, of which number only 510 resulted fatally, showing the lowest yearly death rate ever attained, of 6.54 per cent. Out of this number there were treated for cure in 1911, using 5,000 unit syringes of diphtheria antitoxin for an initial dose, 2,793 cases with but 121 deaths, or the remarkably low death rate of 4.33 per cent. a decrease in the death rate from the previous year of more than two per cent. where the 5,000 unit package of diphtheria antitoxin was used instead of the 3,000 unit package in the first 24 hours for the treatment of diphtheria found among the indigent throughout the State.

In this connection it may be well to note that generally during the year a still greater use of 5,000 unit packages of diphtheria antitoxin was made by the physicians throughout the State in place of the 3,000 unit packages for initial doses in curative treatment with the gratifying result of showing a still greater reduction in the death rate, the records for which in detail will be found in the separate set of tables following, and in the summary of observations on the next page.

ANTITOXIN TREATMENT OF DIPHTHERIA FOR 1910 WITH AN INITIAL DOSE OF 5,000 UNITS.

Relation of Initial Treatment to Time of Onset.

	Period in which initial treatment was made.						
	First day.	Second day.	Third day.	Fourth day.	Fifth day.	Sixth day and over.	Totals.
Total,	771	277	98	42	21	16	1,225
Recoveries,	739	252	89	37	14	13	1,144
Deaths,	32	25	9	5	7	3	81
Percentage of deaths,	4.15	9.02	9.18	11.90	33.33	18.75	6.61

ANTITOXIN TREATMENT OF DIPHTHERIA FOR 1911 WITH AN INITIAL DOSE OF 5,000 UNITS.

Relation of Initial Treatment to Time of Onset.

	Period in which initial treatment was made.						
	First day.	Second day.	Third day.	Fourth day.	Fifth day.	Sixth day and over.	Totals.
Total,	1,712	673	228	98	44	38	2,793
Recoveries,	1,688	642	204	73	36	29	2,672
Deaths,	24	31	24	25	8	9	121
Percentage of deaths,	1.40	4.61	10 53	25.51	18.18	23.68	4.33

The comparison of results obtained for the years 1910 and 1911 will be found in the "Summary of observations upon the use of Diphtheria Antitoxin for the Year 1911" on page of this report, and much interesting information in detail taken from the clinical reports received from physicians will be found in the eight tables beginning on page .

METHOD OF DISTRIBUTION.

When the Commissioner of Health appoints an official distributor a commission is issued in the following form:—

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF HEALTH

Division of Distribution of Biological Products.

Know all men by these presents, that..
residing at............................in the county of............................
State of Pennsylvania, ha.... this..................day of..................19...
been duly appointed Distributor of Diphtheria Antitoxin, at......................
.... County, Pennsylvania, under the rules of the Department of Health.

(Seal) ....
Commissioner of Health.

A physician discovering a case of diphtheria anywhere in his locality among the poor has but to go to the nearest druggist who is a distributor, sign a receipt and secure all the antitoxin he needs for the treatment of the case.

For further detailed information regarding distribution see letter of instructions Form B. P. 516 hereafter quoted.

After appointment the distributor is furnished with an initial supply of serum consisting of five packages of 1,000 units and five packages of 3,000 units, and in about 104 localities in the State, distributors are supplied with a stock of five packages of 5,000 units for curative treatment instead of 3,000 units, for use among the indigent at the special request of physicians at those points, together with blank forms, stamped envelopes, etc., necessary for its distribution; copies of which forms appear immediately following instructions to distributors.

Form B. P. 516.

COMMONWEALTH OF PENNSYLVANIA.
DEPARTMENT OF HEALTH.

Division of Distribution of Biological Products.

INSTRUCTIONS TO DISTRIBUTORS REGARDING THE DISTRIBUTION AND USE OF DIPHTHERIA ANTITOXIN

In the distribution of Diphtheria Antitoxin there are THREE printed forms which MUST be filled out.

FIRST IN IMPORTANCE, FORM B. P. 517 is known as the Application and Receipt. It is in a small book containing 100 numbered pages—50 white and 50 blue—the white to be signed by the physician and forwarded to the Department after the amounts of Antitoxin secured by him are properly placed in the spaces reserved for this purpose; the blue, on which the carbon copy is taken, remains in the book for the Distributor's own record. A space is specially provided in the lower left hand corner of this FORM B. P. 517 for a statement of Distributor's stock of Antitoxin on hand, the filling out of which space will prevent the distributor from ever allowing his stock of Antitoxin to become ENTIRELY exhausted, as a careful examination is made of each Form B. P. 517 immediately upon its receipt and if stock is found to be low, additional supply is at once forwarded. This avoids the expense of telegraph and telephone messages to the Department for additional stock.

A physician having a case of Diphtheria among the poor should immediately APPLY to the nearest Distributor, SIGN a RECEIPT, Form B. P. 517, and secure all the Antitoxin he needs for the treatment of the case. He agrees, as you will see by the Application and Receipt, to return to the Distributor all unused Antitoxin WITHIN TEN DAYS after securing same.

Our experience teaches us that the Distributor should require physicians to sign for the Antitoxin BEFORE securing same, if at all possible, because when they send for it they often fail to come in and receipt for same for several days and sometimes never sign for it at all.

SECOND, FORM B. P. 519—is the little slip found wrapped around the outside of the box of Antitoxin. It is to be filled out by the physician, with the patient's name and address, date of use, physician's signature and address, distributor's name and address, and MUST when returned to the Distributor be forwarded by him to the Department of Health together with the above mentioned Application and Receipt, Form B. P. 517, in the printed stamped envelopes furnished to the Distributor.

THIRD, FORM B. P. 518—is the Clinical Report and is found inside the box of Antitoxin. The Physician fills this out, signs and returns it to the Department at the termination of the case. The Distributor has NOTHING WHATEVER TO DO WITH THIS FORM.

SPECIAL NOTICE, FORM B. P. 524, (copy of which is enclosed herewith) contains instructions relative to sale of Antitoxin belonging to the State supply ONLY in case of emergency. It sometimes happens the private supply of the Distributor becomes exhausted at a time when a call may come from a person well able to pay for same. In such case the Distributor is allowed to take Antitoxin from his State supply with the distinct understanding that it MUST BE IMMEDIATELY REPLACED BY PURCHASE from Messrs. H. M. Alexander & Co., at their market price, and in communicating with them in regard thereto the Distributor should not fail to make it clear the exact number of either 1000, 3000 or 5000 unit packages of STATE goods being replaced. In this connection I would state that the same record is required by the Department for goods that are sold and taken from the State supply as is made for indigent cases, the only difference being that the word "SOLD" must be written across the face of all these records for identification here.

Our distributing agents, Mesrs. H. M. Alexander & Co., Marietta, Pa., have been instructed to forward you an INITIAL supply of 5 packages of 1000 units and 5 packages of 3000 units (or 5000 units) of Antitoxin, and Distributors should bear in mind that an additional supply will be furnished immediately upon notification that this stock is NEARLY exhausted, which notice can be made by simply filling up the space in the lower left hand corner of FORM B. P. 517 specially provided for a statement of stock on hand.

Should an epidemic of Diphtheria break out in your locality, when a large quantity of Antitoxin might be needed at once, you are authorized to telegraph, C. O. D., (using the enclosed code) or to telephone, reversing charges to this office for the necessary additional supply.

SAMUEL G. DIXON M. D.,
Commissioner of Health.

Form B. P. 517.

COMMONWEALTH OF PENNSYLVANIA.

DEPARTMENT OF HEALTH.

APPLICATION AND RECEIPT FOR DIPHTHERIA ANTITOXIN.

I hereby acknowledge the receipt of the following named amount of Diphtheria Antitoxin; for use in the family of..
................packages containing 1,000 units. Laboratory Nos., ...
................packages containing 3,000 units. Laboratory Nos., ...
................packages containing 5,000 units. Laboratory Nos., ...
from ....Distributor, Address, ...
in the name of the Department of Health. I hereby certify that the person or persons mentioned for whom this Antitoxin is furnished for the treatment of Diphtheria are indigent in the sense that they cannot procure the necessities of

life and at the same time purchase Antitoxin. I agree to make no charge for it directly or indirectly, and if unused, to return to the Distributor within ten days; also to mail to the Department of Health, immediately upon termination, a clinical report for each case, on the blanks furnished for this purpose.

We have in stock at this time:

..........packages of 1,000 units.
..........packages of 3,000 units.
..........packages of 5,000 units.

....
(Physician's Signature.)
....
(Address.)

....
(Distributor's Signature.)
....
(Full Address.)

In signing this form physicians also signed an identical copy on blue paper which is for the Distributor's record of the issue of Antitoxin. This is to be forwarded to the Department with Form 519 mentioned below.

Form B. P. 518.

COMMONWEALTH OF PENNSYLVANIA.

DEPARTMENT OF HEALTH.

CLINICAL REPORT OF DIPHTHERIA TREATED WITH ANTITOXIN.

Use a separate blank for each case and forward immediately upon termination of same to the Department of Health, Harrisburg, Pa.
Patient's name,................ Address,................ County,................Pa.
Age,............ Sex,............ Color,............ Date of first visit,............
Mo. Day. Year.
Was treatment immunizing or curative?..

If the treatment was immunizing, answer only the following questions:
Date of treatment,.................................. No. of units used,............
How long had patient been exposed to the disease?..............................
Did patient subsequently contract the disease? (Yes or No)?......................

If the treatment was curative, answer the following questions:

Date of onset of the disease,...

Month. Day. Year.

SPECIFY EACH TREATMENT.

................units used within......hours of onset.
................units used within......hours after first treatment.
................units used within......hours after second treatment.
................units used within......hours after third treatment.
................units used within......hours after fourth treatment.
................units used within......hours after fifth treatment.
................units used within......hours after sixth treatment.
................units used within......hours after seventh treatment.
................units used within......hours after eighth treatment.
................units used within......hours after ninth treatment.

State whether disease was Post-Nasal, Tonsillar, Pharyngeal, Laryngeal.

(specify by *crossing out* names of *regions unaffected.*)

State complications, if any,...
State termination (Recovery or Death)...

Month. Day Year.

Number of persons in household,.... Number affected,.... Number immunized,....
What was the probable source of infection?..............................
Remarks, ...
....
Distributor's Name,....................... Signature,.......................M. D.
Address, ... Address,..................................

The above is the clinical report which gives the complete medical history of the case from the beginning of treatment to recovery or death and which is to be signed by the physician and forwarded to the Department.

Form B. P. 519.

Diphtheria Antitoxin.
.... Units.
Manufacturer.
....
Laboratory No.

Date within which the unopened vial or attached slip must be returned to
Distributor, ...
....

COMMONWEALTH OF PENNSYLVANIA.

DEPARTMENT OF HEALTH.

Diphtheria Antitoxin, ...Units.
Manufacturer, ...Laboratory No........
Patient, ...Address, ...
Date of use, ...
Physician's signature, ...
Address, ...
Distributor's signature, ...
Address, ...
This slip when returned to Distributor must be forwarded to the Department of Health, together with the application for the same.
SAMUEL G. DIXON, Commissioner.

This slip is found placed around the outside of the packages of antitoxin and is to be filled out by the physician using same; giving the name of patient and address, date of use, physician's name and address, distributor's signature and address, and to be forwarded to the Department with Form B. P. 517 above mentioned.

These slips, Form B. P. 519, are filled out for 1,000 units, immunizing, and 3,000 and 5,000 units, curative treatment, respectively; each slip or Form B. P. No. 519 representing one package of 1,000, 3,000, or 5,000 units strength; having also printed thereon the laboratory number of the package of antitoxin produced by the manufacturer.

The three forms above mentioned, B. P. 517-518 and 519, when properly filled out, make a complete record of each case of the distribution and use of diphtheria antitoxin issued by the Department of Health to the indigent throughout the entire State of Pennsylvania.

The following statement giving the number of syringes of diphtheria antitoxin *supplied* to distributors during the last three months of 1905, and during each month of the years 1906, to 1911, respectively, shows a steadily increasing demand for the use of this life saving agent in the treatment of diphtheria among the poor:—

NUMBER OF SYRINGES OF ANTITOXIN SUPPLIED TO DISTRIBUTORS BY MONTHS FROM OCTOBER 1ST, 1905, TO DECEMBER 31ST, 1911.

Years.	Units.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Totals.
1905, ...	1,000	....	....	....	....	....	....	....	....	....	64	2,517	377	2,958
	3,000	....	....	....	....	....	....	....	....	....	59	2,488	462	3,009
1906, ...	1,000	314	256	289	285	148	118	156	1,143	564	1,016	824	525	4,638
	3,000	503	394	455	476	295	243	314	336	768	1,408	1,271	1,007	7,470
1907, ...	1,000	400	269	327	316	282	221	363	526	347	648	670	804	5,173
	3,000	809	547	648	641	468	433	535	824	702	784	1,297	1,293	8,981
1908, ...	1,000	467	401	380	503	437	515	448	590	484	917	725	826	6,793
	3,000	807	861	734	752	541	811	605	614	920	1,504	1,534	1,619	11,302
	5,000							....	50	5	20	20	20	115
1909, ...	1,000	586	979	681	517	717	766	376	373	446	1,189	1,228	822	8,680
	3,000	1,171	887	1,127	770	972	821	865	817	844	1,774	1,712	1,461	13,221
	5,000	18	28	13	15	0	38	8	18	13	78	115	73	417
1910, ...	1,000	524	632	906	153	789	270	370	586	743	1,079	1,067	1,489	8,608
	3,000	1,275	1,127	985	877	1,028	682	616	816	993	1,455	1,412	1,150	12,416
	5,000	50	79	77	67	193	179	146	397	396	516	593	547	3,240
1911, ...	1,000	804	967	602	433	897	518	395	702	1,389	1,783	1,629	1,173	11,292
	3,000	1,016	895	938	718	744	676	635	840	1,191	1,916	1,506	1,139	12,214
	5,000	526	314	382	279	348	327	253	302	594	1,232	1,142	953	6,652

SYRINGES OF ANTITOXIN SUPPLIED TO DISTRIBUTORS, 1905-1911.

	1,000 units.	3,000 units.	5,000 units.
1905,	2,958	3,009	0
1906,	4,638	7,470	0
1907,	5,173	8,981	0
1908,	6,793	11,302	115
1909,	8,680	13,221	417
1910,	8,608	12,416	3,240
1911,	11,292	12,214	6,652
	48,142	68,613	10,424

The following statement giving the number of syringes of diphtheria antitoxin actually *dispensed* by distributors during the three months of 1905 and during each month for the years 1906, to 1911, respectively, also shows a steadily increasing use of diphtheria antitoxin for the treatment of diphtheria among the poor.

The difference between the number of syringes *supplied* and those *used* will show the amount of antitoxin in the hands of the distributors, the cost of which antitoxin is already accounted for in the statement giving the total cost of same.

NUMBER OF SYRINGES OF ANTITOXIN DISPENSED BY DISTRIBUTORS BY MONTHS FROM OCTOBER 1ST, 1905, TO DECEMBER 31ST, 1911.

	Units.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Totals.
1905, ...	1,000												327	327
	3,000												619	619
1906, ...	1,000	210	225	231	190	157	117	106	174	434	701	681	499	3,725
	3,000	474	372	404	337	291	233	221	320	657	1,129	1,135	991	6,564
1907, ...	1,000	328	301	277	264	230	190	267	429	327	502	527	572	4,214
	3,000	758	572	625	522	497	363	491	620	671	1,058	1,111	1,021	8,309
1908, ...	1,000	427	403	189	127	257	192	230	213	497	603	579	609	4,326
	3,000	806	822	439	369	527	488	344	367	847	1,234	1,346	1,251	8,840
	5,000									18	14	17	12	61
1909, ...	1,000	501	681	360	396	325	188	326	280	371	1,178	628	724	5,958
	3,000	1,051	860	793	576	682	532	661	667	858	1,641	1,322	1,443	11,086
	5,000	4	16	15	21	1	14	7	14	28	29	55	80	284
1910, ...	1,000	518	458	421	421	309	297	308	382	631	838	881	773	6,237
	3,000	984	994	873	856	686	632	588	689	842	1,136	1,258	963	10,501
	5,000	62	47	72	72	46	149	142	295	376	502	546	491	2,800
1911, ...	1,000	624	514	641	456	365	380	323	480	904	1,376	1,164	953	8,180
	3,000	805	738	846	552	501	514	590	606	1,041	1,399	1,428	980	10,000
	5,000	497	324	399	294	259	292	241	311	524	1,039	987	909	6,076

SYRINGES OF ANTITOXIN DISPENSED BY DISTRIBUTORS, 1905-1911.

	1,000 Units.	3,000 Units.	5,000 Units.	Number of distributors.
1905,	327	619	0	473
1906,	3725	6564	0	511
1907,	4214	8309	0	529
1908,	4326	8840	61	569
1909,	5958	11086	284	650
1910,	6237	10501	2800	656
1911,	8180	10000	6076	662
Total,	32967	55919	9221	....

SUMMARY OF OBSERVATIONS UPON THE USE OF DIPHTHERIA ANTITOXIN IN PENNSYLVANIA FOR THE YEAR 1911.

CURATIVE TREATMENT.

The statistics compiled as taken from the clinical reports received from physicians covering the curative treatment of diphtheria among the indigent for the year 1911 show a great decrease in the death rate over the year 1910, from 8.56 per cent. to 6.54 per cent., or more than two per cent. It might also be stated here that many more of the physicians in the State than in the previous year have deemed it wise to use 5,000 unit packages of antitoxin instead of 3,000 units as the initial dose, with the result that the death rate has been reduced from 6.61 per cent. to 4.33 per cent., the lowest death rate yet attained in the history of the use of 5,000 unit doses of diphtheria antitoxin within the first 24 hours of onset of the disease.

It will be shown by a comparison of Table No. 1 for the year 1910 with the same table for 1911 that 7,793 persons were treated for diphtheria with but 510 deaths, an increase in the number treated over the year 1910 of 1,269 and a decrease in the number of deaths of 49. It will be noted in this table for 1911 that the death rate in the treatment of cases of diphtheria where both 3,000 and 5,000 unit syringes of antitoxin were used within the first twenty-four hours is 3.11 per cent., a marked decrease over the previous year. While this death rate is low yet on referring to Table No. 1 where the initial dose was 5,000 units in the first twenty-four hours of treatment it will be seen that the mortality has been reduced to 1.40 per cent.,

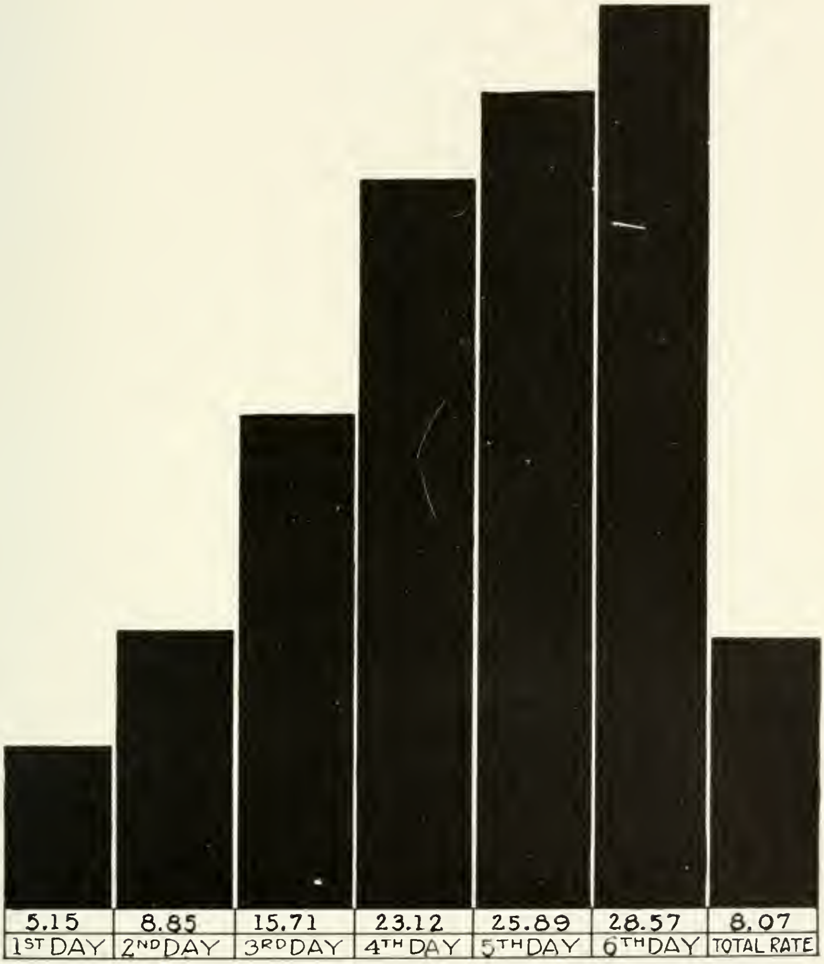


DIAGRAM GIVING PERCENTAGE OF DEATHS IN 35,111 CASES TREATED WITH DIPHTHERIA ANTITOXIN IN 24 HOUR PERIODS FROM 1905 TO 1911 INCLUSIVE

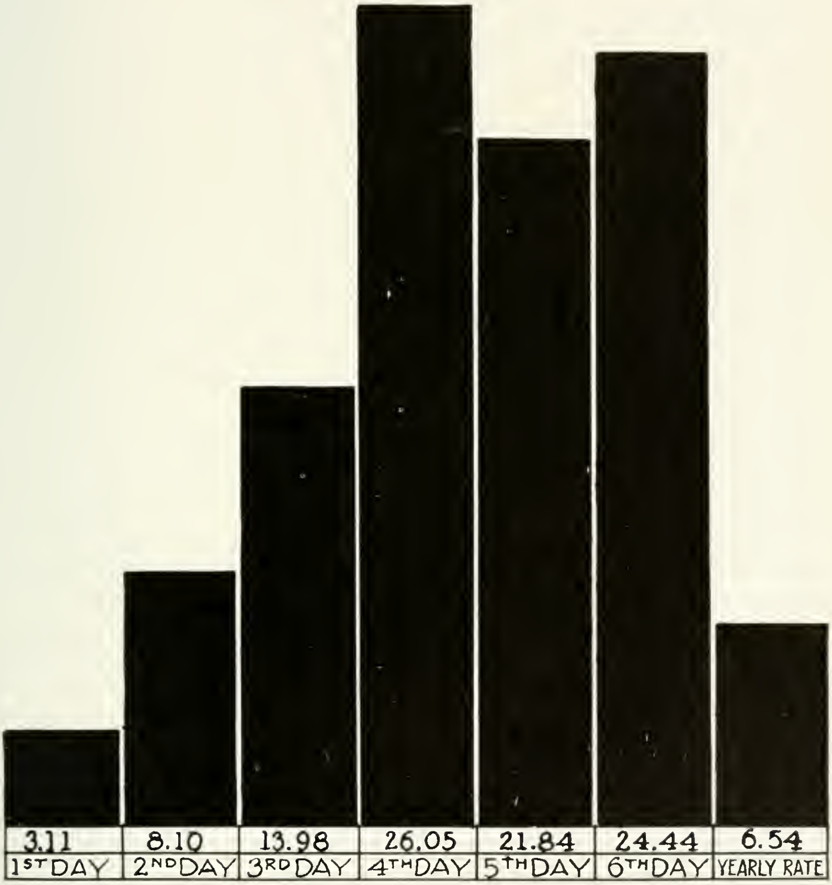


DIAGRAM GIVING PERCENTAGE OF DEATHS IN 7793 CASES TREATED WITH DIPHTHERIA ANTITOXIN IN 24 HOUR PERIODS FOR 1911

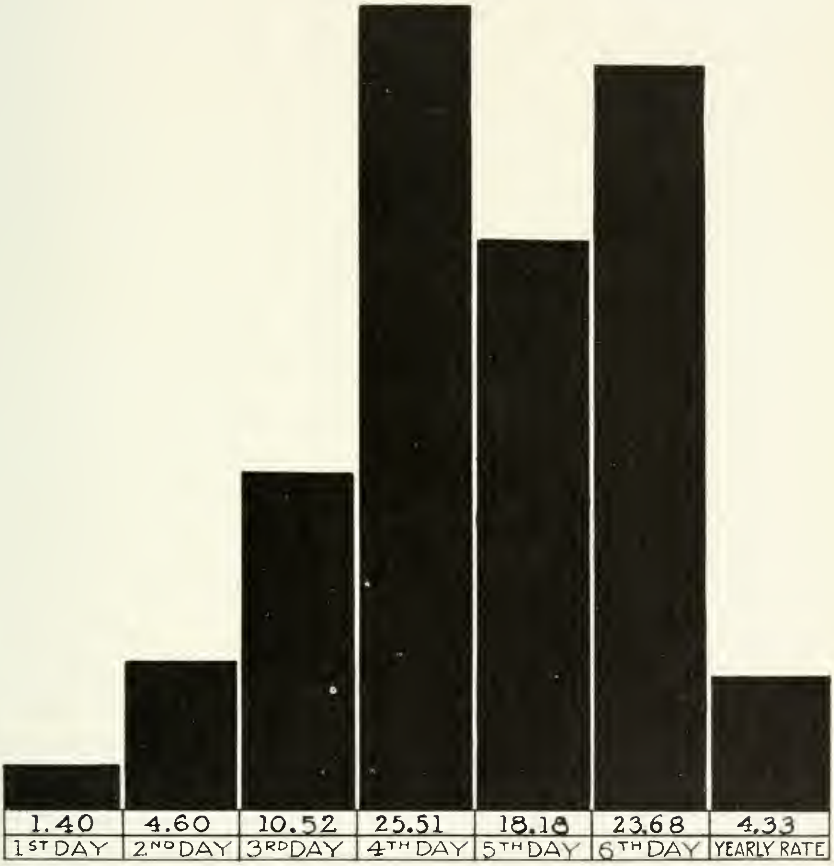


DIAGRAM GIVING PERCENTAGE OF DEATHS IN 2793 CASES WHERE 5000 UNIT DOSES DIPHTHERIA ANTITOXIN WERE USED IN 24 HOUR PERIODS FOR 1911

a lower death rate than that attained in the first twenty-four hour treatment in any previous year, a strong argument in favor of the larger dose of antitoxin within the first twenty-four hours after the onset of the disease.

In Table No. 2, showing results of treatment of diphtheria with antitoxin with relation to sex and age, it will be found that there was an increase in number of males, or 3,715, as compared with 3,134 treated in 1910, and a very marked increase, or 4,078 in 1911 as compared with 3,390 females in the year 1910. It also shows that the greatest number of cases treated for diphtheria, an increase of 628 in 1911 over 1910, in both sexes, were children between the ages of five and nine years, the females again slightly predominating in 1911, with 1,516, as against 1,222 in 1910, and the males with 1,489 in 1911, as against 1,125 in 1910.

In Table No. 3, showing results of treatment of diphtheria with antitoxin acording to period of initial treatment after onset and age, it will be seen that an increased number or 1,918 children were treated in 1911 between the ages of five and nine years as compared with 1,517 in the year 1910. It will also be noticed in this table that more than one half of the entire number of 7,793 cases treated, 4,015 cases were found to be among children between the ages of two and fourteen years, a marked increase in the number of cases treated between these ages in 1911 as compared with the previous year.

In Table No. 4, showing treatment of diphtheria with antitoxin according to areas affected and period of initial treatment after onset of disease, it will appear that the largest number of cases were found to be of the type known as tonsillar diphtheria, there being 3,174 cases treated with only 37 deaths, or a death rate of but 1.16 per cent., being a lower death rate than shown in previous years by this table for this type of disease where both 3,000 and 5,000 unit syringes were used. The percentage of deaths, however, for this tonsillar type of disease, by the use of 5,000 unit syringes only has been brought down to .59 per cent. of deaths. The highest death rate shown by this table is 28.57 per cent., where the cases developed all four types of the disease, post-nasal, tonsillar, pharyngeal and laryngeal. The second highest death rate shown, or 22.72 per cent., appears where the cases developed three types of the disease, post-nasal, tonsillar and laryngeal, and where the laryngeal type of diphtheria appeared, reveals a death rate of only 17.98 per cent. A general reduction in death rate being observed in all specific types mentioned as shown in this table for 1911 over 1910.

In Table No. 5, showing results of treatment of diphtheria with antitoxin in the sixty-six counties by the months for the year 1911, it will be observed that diphtheria was again, as in 1910, prevalent in all of the 66 counties where antitoxin was distributed for the treatment of diphtheria among the poor; that Allegheny county heads the list with the greatest number of cases, or 923, with a death rate of 5.20 per cent., as against 652 cases in the previous year, with a death rate of 9.04 per cent.; Lackawanna county this year is second with 632 cases with 29 deaths and a death rate of 4.58 per cent.; Dauphin county is third with 559 cases treated with 30 deaths, or a death rate of 5.36 per cent. The highest death rate shown by this table appears in the cases treated in Perry county, where only 19 cases occurred with 5 deaths, or a death rate of 26,31 per cent. The lowest death rate is found this year in Elk county, where 52 cases were treated among the poor with but one death, or the remarkably low death rate of 1.92 per cent. Blair county, shows a death rate of only 2.51 per cent.; with Beaver, Crawford, Erie, Jefferson, Lawrence and Warren counties, all showing a death rate less than 4 per cent.; Allegheny, Crawford, Dauphin, Franklin, Lackawanna, Luzerne, Mercer, Montour, Northampton and Tioga counties, with percentages of deaths ranging over 4 per cent. but less than 6 per cent. of deaths; with Butler, Carbon, Clearfield, Delaware, Indiana, Lebanon, Mifflin, Montgomery,Northumberland, Somerset, Westmoreland, and York counties showing between 6 and 8 per cent. of deaths. Another interesting feature shown by this table is in the treatment of the cases of diphtheria in Bradford with 13 cases; Cameron with 1 case; Forest with 2 cases; Fulton with 1 case; Greene with 17 cases; Juniata with 1 case; McKean with 13 cases; Pike with 3 cases; Snyder with 15 cases; Sullivan with 13 cases; Union with 1 case; Venango with 47 cases; Wayne with 20 cases; and Wyoming with 23 cases; the result being in each of the fourteen counties mentioned, 100 per cent. of recoveries. Another very interesting feature revealed by Table No. 5 of the separate set of tables showing results of treatment where 5,000 unit doses of antitoxin were used in the first twenty-four hours is the remarkably low death rate found in Blair county, where 75 cases treated resulted in but one death, or a mortality of but 1.33 per cent. It will also be found in this same table that 100 per cent. of recoveries resulted in 19 counties out of 47 where physicians used 5,000 units of antitoxin in the first 24 hours of onset of the disease, namely,—Adams county, 5 cases; Beaver county, 13 cases; Bedford county, 2 cases; Bradford county, 1 case; Centre county, 1 case; Clarion county, 1 case; Clinton county, 1 case; Columbia county, 2 cases; Franklin county, 5 cases; Jefferson county, 6 cases; Lancaster county, 1 case; McKean county, 1 case; Mercer county, 9 cases; Montgomery county, 7 cases; Montour county, 8 cases; Northampton county, 21 cases; Somerset county, 1 case; Venango county, 8 cases; and Wayne county, 10 cases, being examples of much better results brought about by following the repeated requests of the Commissioner of Health to use larger doses in the first twenty-four hours of onset of the disease.

In Table No. 6, showing results of treatment of diphtheria with antitoxin according to number of units used and period of treatment after onset, it will be seen that the initial curative dose of 3,000 units of antitoxin was administered within the first twenty-four hours of onset in 1,988 cases, with only 106 deaths, or a death rate of 5.33 per cent., an indication that more cases each year are being treated with antitoxin in the first twenty-four hours with better results. This table also shows that the largest amount of antitoxin used to effect a recovery in a single case, was 120,000 units, the second largest amount ever reported to the Department used for a single case of diphtheria. It will also be noticed in this table that the total number of units of antitoxin used for the treatment of any one case ranges from 500 units, by gradual increases of from 500 to 3,000 units, until the maximum of 120,000 units is reached. A marked increase in the number of cases treated where 5,000 units of antitoxin were used in the first twenty-four hours in 1911 is shown over the year 1910; there being 1,041 cases with but 9 deaths.

In Table No. 7, showing the number of cases where subsequent treatments with antitoxin were administered after the first twenty-four hours, it will be shown that the number of units used, range all the way from 250 up to the maximum number of 110,000. It will also be noticed in this table of subsequent treatments that additional doses of 5,000 units of antitoxin were given in 561 cases, with only 40 deaths.

For the information of those interested and for the details of use of 5,000 unit packages in the first twenty-four hours of onset of the disease, a separate set of tables, from No. 1 to No. 7, inclusive, will immediately follow the other tables showing curative treatment; the total number of cases treated for this year being arranged in two sets of tables, numbered from 1 to 7, each, inclusive, the first set of tables showing curative treatment where 3,000 units and 5,000 units of antitoxin were used and the second set of tables showing curative treatment where 5,000 units of antitoxin were used within the first twenty-four hours of onset of the disease, which tables show in detail the exact number of cases treated from January 1st, 1911, to December 31st, 1911, and the results tabulated under the following headings:—

1. Period of initial treatment after onset of disease.
2. Showing results of treatment according to sex and age.
3. Period of initial treatment after onset and age.
4. Areas affected and period of initial treatment after onset of disease.
5. Number of cases treated in the several counties of the State by months with results.

6. Result of treatment of diphtheria with antitoxin according to number of units used and period of treatment after onset of disease.

7. Statement showing cases where subsequent treatments of antitoxin were used after first twenty-four hours.

8. Number immunized, with result.

TABLE I.

Antitoxin Treatment of Diphtheria for 1911.

Initial Dose 3,000 and 5,000 Units.

Relation of Initial Treatment to Time of Onset.

Results.	Period in which initial treatment was made.						
	1st day.	2nd day.	3rd day.	4th day.	5th day.	6th day and over.	Total.
Totals,	4,847	1,789	665	238	119	135	7,793
Recoveries,	4,696	1,644	572	176	93	102	7,283
Deaths,	151	145	93	62	26	33	510
Percentage of deaths,	3.11	8.10	13.98	26.05	21.85	24.44	6.54

TABLE II.

Antitoxin Treatment of Diphtheria for 1911.

Initial Dose 3,000 and 5,000 Units.

Result of Treatment of Diphtheria with Antitoxin With Relation to Sex and Age.

Results.	Sex.	Age Periods.										
		0-1	1-2	2-3	3-4	4-5	5-9	10-14	15-19	20+	Total.	
Totals,	M.,	54	185	307	346	433	1,489	481	169	251	3,715	7,793
	F.,	54	138	244	340	359	1,516	610	282	535	4,078	
Recoveries,	M.,	46	150	267	306	395	1,407	466	166	242	3,445	7,283
	F.,	48	114	206	306	330	1,415	586	274	529	3,838	
Deaths,	M.,	8	35	40	40	38	82	15	3	9	270	510
	F.,	6	24	38	34	29	71	24	8	6	240	

TABLE III.

Antitoxin Treatment of Diphtheria for 1911.
Initial Dose 3,000 and 5,000 Units.
Result of Treatment of Diphtheria with Antitoxin According to Period of Initial Treatment after Onset and Age.

Period of Treatment	Results.	Age Periods.									Total.	Percentage.
		0–1	1–2	2–3	3–4	4–5	5–9	10–14	15–19	20+		
1st day, ..	Totals,	58	176	335	412	465	1,918	709	273	501	4,847	
	Rec., ...	53	161	308	388	448	1,876	697	270	495	4,696	
	Deaths,	5	15	27	24	17	42	12	3	6	151	3.11
2nd day, ..	Totals,	31	85	121	146	188	679	230	115	194	1,789	
	Rec. ...	26	61	101	125	168	636	225	112	190	1,644	
	Deaths,	5	24	20	21	20	43	5	3	4	145	8.10
3d day, ..	Totals,	13	34	62	75	82	233	80	34	52	665	
	Rec., ...	11	26	43	61	66	207	74	34	50	572	
	Deaths,	2	8	19	14	16	26	6	0	2	93	13.98
4th day, ..	Totals,	2	11	14	27	35	85	36	14	14	238	
	Rec., ...	1	5	10	17	27	62	30	12	12	176	
	Deaths,	1	6	4	10	8	23	6	2	2	62	26.05
5th day, ..	Totals,	1	8	13	9	9	42	15	8	14	119	
	Rec., ...	1	6	7	7	6	35	11	6	14	93	
	Deaths,	0	2	6	2	3	7	4	2	0	26	21.84
6th day and over, ...	Totals,	3	9	6	17	13	48	21	7	11	135	
	Rec., ...	2	5	4	14	10	36	15	6	10	102	
	Deaths,	1	4	2	3	3	12	6	1	1	33	24.44
Total treatments, ..		......	......	......	......	......	......	......	......	......	7,793	
Total deaths, ...		......	......	......	......	......	......	......	......	......	510	6.54

TABLE IV.

Antitoxin Treatment of Diphtheria for 1911.
Initial Dose 3,000 and 5,000 Units.
Result of Treatment of Diphtheria with Antitoxin According to Areas affected and Period of Initial Treatment after Onset of Disease.

Area.	Results.	Period within which initial treatment was made.						Total.	Percentage.
		1st day.	2nd day.	3rd day.	4th day.	5th day.	6th day and over.		
Post nasal, ...	Totals,	72	33	21	8	8	5	147	
	Rec., ...	67	27	20	8	4	4	130	
	Deaths, .	5	6	1	0	4	1	17	11.57

TABLE IV.—Continued.

Area.	Results.	Period within which initial treatment was made.						Total.	Percentage.
		1st day.	2nd day.	3rd day.	4th day.	5th day.	6th day and over.		
Pharyngeal,	Totals,	123	56	7	7	2	3	198	
	Rec., ...	119	49	6	7	2	3	186	
	Deaths,	4	7	1	0	0	0	12	6.06
Tonsillar,	Totals,	2282	637	152	46	28	29	3174	
	Rec., ...	2271	629	145	38	27	27	3137	
	Deaths,	11	8	7	8	1	2	37	1.16
Laryngeal,	Totals,	462	183	80	27	13	19	784	
	Rec., ...	407	142	58	16	9	11	643	
	Deaths,	55	41	22	11	4	8	141	17.98
All combined,	Totals,	62	26	14	12	4	8	126	
	Rec., ...	55	17	9	6	1	2	90	
	Deaths,	7	9	5	6	3	6	36	28.57
Pn. and Phar.,	Totals,	29	17	7	0	1	1	55	
	Rec., ...	27	15	6	0	0	1	49	
	Deaths, .	2	2	1	0	1	0	6	10.91
Pn., Phar., Ton.,	Totals,	257	127	90	44	16	17	551	
	Rec., ...	237	108	71	30	13	14	473	
	Deaths, .	20	19	19	14	3	3	78	14.16
Pn., Ton., Lar.,	Totals,	4	11	5	2	0	0	22	
	Rec., ...	3	9	4	1	0	0	17	
	Deaths, .	1	2	1	1	0	0	5	22.73
Pn. and Lar.,	Totals,	24	11	4	2	1	3	45	
	Rec., ...	24	11	3	0	1	2	41	
	Deaths, .	0	0	1	2	0	1	4	8.89
Ton. and Lar.,	Totals,	63	47	35	13	6	5	169	
	Rec., ...	60	44	26	8	3	3	144	
	Deaths,	3	3	9	5	3	2	25	14.79
Ph., Ton., Lar.,	Totals,	108	63	41	23	6	9	250	
	Rec., ...	93	46	34	13	3	6	195	
	Deaths, .	15	17	7	10	3	3	55	22.00
Ph. and Ton.,	Totals,	910	402	129	37	16	14	1508	
	Rec., ...	902	387	122	36	13	12	1472	
	Deaths, .	8	15	7	1	3	2	36	2.39
Ph. and Ton.,	Totals,	340	124	56	14	12	11	557	
	Rec., ...	333	115	50	10	12	10	530	
	Deaths, .	7	9	6	4	0	1	27	4.85
Ph. and Lar.,	Totals,	80	41	20	3	4	10	158	
	Rec., ...	68	35	15	3	3	6	130	
	Deaths,	12	6	5	0	1	4	28	17.72

TABLE IV.—Continued.

Area.	Results.	Period Within Which Initial Treatment was Made.						Total.	Percentage.
		1st day.	2nd day.	3rd day.	4th day.	5th day.	6th day and over.		
Ph., Ph., Lar.,	Totals,	31	11	4	0	2	1	49	
	Rec., ...	30	10	3	0	2	1	46	
	Deaths, .	1	1	1	0	0	0	3	6.12
Total treatments,	Rec., ...	......	......	......	......	......	......	7793	
Total deaths,	Deaths, .	......	......	......	......	......	......	510	6.54

TABLE V.

Antitoxin Treatment of Diphtheria for 1911.

Initial Dose 3,000 and 5,000 Units.

Result of Treatment of Diphtheria with Antitoxin in the several Counties by the Months.

County.	Results.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.	Percentage.
Adams, ...	Totals,	3	1	0	0	0	0	2	0	0	0	2	4	12	
	Rec., ...	3	1	0	0	0	0	2	0	0	0	0	3	9	
	Deaths,	0	0	0	0	0	0	0	0	0	0	2	1	3	25.
Allegheny, .	Totals,	43	28	28	24	38	34	33	56	137	178	194	130	923	
	Rec., ..	40	26	26	23	37	30	31	53	128	171	184	126	875	
	Deaths,	3	2	2	1	1	4	2	3	9	7	10	4	48	5.20
Armstrong,	Totals,	2	3	13	8	7	17	7	11	6	13	10	18	115	
	Rec., ...	1	2	12	8	7	15	7	9	6	11	8	11	97	
	Deaths,	1	1	1	0	0	2	0	2	0	2	2	7	18	15.65
Beaver, ...	Totals,	1	14	8	5	4	4	0	1	3	19	17	15	91	
	Rec., ...	0	14	8	5	4	4	0	1	2	19	16	15	88	
	Deaths,	1	0	0	0	0	0	0	0	1	0	1	0	3	3.29
Bedford, .	Totals,	3	0	1	2	1	0	0	0	0	3	9	1	20	
	Rec., ...	3	0	0	2	1	0	0	0	0	2	7	1	16	
	Deaths,	0	0	1	0	0	0	0	0	0	1	2	0	4	20.
Blair, ...	Totals,	17	14	16	9	6	4	12	2	5	19	29	26	159	
	Rec., ...	17	13	16	9	6	4	12	2	5	19	27	25	155	
	Deaths,	0	1	0	0	0	0	0	0	0	0	2	1	4	2.51

TABLE V.—Continued.

County.	Results.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.	Percentage.
Bradford, .	Totals,	0	0	3	1	0	2	1	1	3	1	1	0	13	
	Rec., ...	0	0	3	1	0	2	1	1	3	1	1	0	13	
	Deaths, .	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
Berks, ...	Totals,	7	17	14	18	6	6	8	11	12	22	18	26	165	
	Rec., ...	5	15	14	15	5	6	6	10	10	19	14	26	145	
	Deaths,	2	2	0	3	1	0	2	1	2	3	4	0	20	12.12
Bucks, ...	Totals,	7	10	6	4	2	4	7	3	4	2	6	9	64	
	Rec., ...	5	9	6	3	2	3	7	3	4	1	6	9	58	
	Deaths,	2	1	0	1	0	1	0	0	0	1	0	0	6	9.37
Butler, ...	Totals,	4	2	1	3	0	1	1	1	7	11	9	4	44	
	Rec., ...	4	2	1	3	0	0	1	1	7	11	7	4	41	
	Deaths,	0	0	0	0	0	1	0	0	0	0	2	0	3	6.81
Cambria, ..	Totals,	8	5	15	5	7	2	5	12	28	15	17	22	141	
	Rec., ...	8	5	15	5	6	2	5	10	27	13	16	17	129	
	Deaths,	0	0	0	0	1	0	0	2	1	2	1	5	12	8.51
Cameron, .	Totals.	0	0	0	0	1	0	0	0	0	0	0	0	1	
	Rec., ...	0	0	0	0	1	0	0	0	0	0	0	0	1	
	Deaths, .	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
Carbon, ...	Totals,	4	19	8	14	5	5	1	1	2	8	2	8	77	
	Rec., ...	3	18	7	13	5	4	1	1	2	8	2	8	72	
	Deaths,	1	1	1	1	0	1	0	0	0	0	0	0	5	6.49
Centre, ...	Totals,	1	3	0	0	0	1	0	0	0	0	2	0	7	
	Rec., ...	0	3	0	0	0	1	0	0	0	0	2	0	6	
	Deaths,	1	0	0	0	0	0	0	0	0	0	0	0	1	14.28
Chester, ..	Totals,	12	11	11	7	12	7	8	10	11	5	11	6	111	
	Rec., ...	11	10	11	6	12	7	7	10	11	4	7	4	100	
	Deaths, .	1	1	0	1	0	0	1	0	0	1	4	2	11	9.91
Clarion, ...	Totals,	1	3	4	0	0	3	0	0	0	1	3	0	15	
	Rec., ...	1	2	4	0	0	3	0	0	0	1	1	0	12	
	Deaths,	0	1	0	0	0	0	0	0	0	0	2	0	3	20.
Clearfield, .	Totals,	2	2	3	3	3	1	3	6	17	16	17	29	102	
	Rec., ...	2	2	3	2	3	1	2	6	13	15	16	29	94	
	Deaths,	0	0	0	1	0	0	1	0	4	1	1	0	8	7.84
Clinton, ...	Totals,	0	0	1	1	5	1	0	1	1	1	0	0	11	
	Rec., ...	0	0	1	1	4	1	0	1	1	1	0	0	10	
	Deaths, .	0	0	0	0	1	0	0	0	0	0	0	0	1	9.09
Columbia, .	Totals,	1	1	8	2	3	2	3	1	10	7	10	3	51	
	Rec., ...	1	1	7	1	3	2	3	1	10	7	7	3	46	
	Deaths,	0	0	1	1	0	0	0	0	0	0	3	0	5	9.80
Crawford,	Totals,	0	2	2	0	0	0	4	2	1	5	2	6	24	
	Rec., ...	0	2	2	0	0	0	3	2	1	5	2	6	23	
	Deaths,	0	0	0	0	0	0	1	0	0	0	0	0	1	4.16

TABLE V.—Continued.

County.	Results.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.	Percentage.
Cumberland,	Totals,	8	3	10	3	1	0	4	3	6	13	10	13	74	
	Rec., ...	6	3	9	3	1	0	4	3	6	13	8	12	68	
	Deaths,	2	0	1	0	0	0	0	0	0	0	2	1	6	8.10
Dauphin, ..	Totals, ..	26	25	33	45	44	21	24	24	58	79	110	70	559	
	Rec., ...	25	25	31	43	42	18	24	24	52	75	105	65	529	
	Deaths,	1	0	2	2	2	3	0	0	6	4	5	5	30	5.36
Delaware, .	Totals, ..	10	12	13	9	14	3	10	9	3	21	13	11	128	
	Rec., ...	7	11	11	9	12	3	10	9	3	21	13	10	119	
	Deaths,	3	1	2	0	2	0	0	0	0	0	0	1	9	7.03
Elk, ...	Totals,	1	0	0	0	5	6	5	1	8	10	8	8	52	
	Rec., ...	1	0	0	0	4	6	5	1	8	10	8	8	51	
	Deaths,	0	0	0	0	1	0	0	0	0	0	0	0	1	1.92
Erie, ...	Totals,	5	4	17	13	9	6	5	10	9	5	14	17	114	
	Rec., ...	5	4	16	13	9	6	5	10	8	5	12	17	110	
	Deaths,	0	0	1	0	0	0	0	0	1	0	2	0	4	3.50
Fayette, ...	Totals,	3	4	9	1	4	1	10	7	17	23	27	12	118	
	Rec., ...	2	2	7	1	4	1	8	7	17	20	23	12	104	
	Deaths,	1	2	2	0	0	0	2	0	0	3	4	0	14	11.86
Forest, ...	Totals,	0	0	0	0	0	1	1	0	0	0	0	0	2	
	Rec., ...	0	0	0	0	0	1	1	0	0	0	0	0	2	
	Deaths, .	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
Franklin, .	Totals,	8	2	1	3	5	1	0	1	12	16	22	15	86	
	Rec., ...	8	2	1	3	5	1	0	1	11	14	21	14	81	
	Deaths,	0	0	0	0	0	0	0	0	1	2	1	1	5	5.81
Fulton, ...	Totals,	0	0	0	0	0	0	0	0	0	0	1	0	1	
	Rec., ..	0	0	0	0	0	0	0	0	0	0	1	0	1	
	Deaths,	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
Greene, ...	Totals,	0	1	0	0	2	0	2	1	3	2	3	3	17	
	Rec., ..	0	1	0	0	2	0	2	1	3	2	3	3	17	
	Deaths,	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
Huntingdon,	Totals,	0	1	1	5	0	0	0	1	4	6	5	1	24	
	Rec., ...	0	1	1	4	0	0	0	1	4	6	5	0	22	
	Deaths,	0	0	0	1	0	0	0	0	0	0	0	1	2	8.33
Indiana, ..	Totals,	3	7	6	2	2	6	6	2	13	9	15	10	81	
	Rec., ...	3	5	6	2	1	6	6	2	13	9	13	9	75	
	Deaths.	0	2	0	0	1	0	0	0	0	0	2	1	6	7.40
Jefferson, .	Totals,	3	8	9	10	7	9	9	17	23	40	23	25	183	
	Rec., ...	3	8	8	10	7	9	8	17	23	38	20	25	176	
	Deaths,	0	0	1	0	0	0	1	0	0	2	3	0	7	3.82
Juniata, ..	Totals,	1	0	0	0	0	0	0	0	0	0	0	0	1	
	Rec., ...	1	0	0	0	0	0	0	0	0	0	0	0	1	
	Deaths,	0	0	0	0	0	0	0	0	0	0	0	0	0	0.

TABLE V.—Continued.

County.	Results.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.	Percentage.
Lackawanna, ..	Totals,	34	48	58	51	27	35	25	42	58	96	89	69	632	
	Rec., ...	33	44	53	48	26	35	24	40	54	91	88	67	603	
	Deaths,	1	4	5	3	1	0	1	2	4	5	1	2	29	4.58
Lancaster, .	Totals,	4	9	2	7	4	5	1	7	6	14	37	22	118	
	Rec., ...	1	8	2	5	0	3	0	7	6	14	35	20	101	
	Deaths,	3	1	0	2	4	2	1	0	0	0	2	2	17	14.40
Lawrence, .	Totals,	7	4	1	2	4	16	14	39	68	137	66	57	415	
	Rec., ...	7	3	0	2	3	16	13	39	65	134	65	52	399	
	Deaths,	0	1	1	0	1	0	1	0	3	3	1	5	16	3.85
Lebanon, ..	Totals,	12	13	5	1	6	7	2	9	30	64	38	21	208	
	Rec., ...	9	13	5	1	5	7	2	8	29	60	34	21	194	
	Deaths,	3	0	0	0	1	0	0	1	1	4	4	0	14	6.73
Lehigh, ...	Totals,	8	14	27	11	14	18	10	13	18	36	29	24	222	
	Rec., ...	7	12	21	10	14	17	10	13	18	31	28	22	203	
	Deaths,	1	2	6	1	0	1	0	0	0	5	1	2	19	8.55
Luzerne, ..	Totals,	24	61	52	40	52	41	23	34	60	70	54	47	558	
	Rec., ...	19	59	49	39	51	39	20	33	59	67	50	47	532	
	Deaths,	5	2	3	1	1	2	3	1	1	3	4	0	26	4.65
Lycoming,	Totals,	3	1	4	5	1	1	1	2	1	4	21	7	51	
	Rec., ...	3	0	4	5	1	1	1	1	1	4	18	6	45	
	Deaths,	0	1	0	0	0	0	0	1	0	0	3	1	6	11.76
McKean, ..	Totals,	1	2	1	0	1	1	1	2	0	2	1	1	13	
	Rec., ...	1	2	1	0	1	1	1	2	0	2	1	1	13	
	Deaths,	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
Mercer, ...	Totals,	0	3	5	2	1	9	2	7	17	81	22	18	117	
	Rec., ...	0	3	5	2	1	8	1	7	17	31	21	16	112	
	Deaths,	0	0	0	0	0	1	1	0	0	0	1	2	5	4.27
Mifflin, ...	Totals, ..	1	1	0	0	0	5	0	0	3	12	10	6	38	
	Rec., ...	1	1	0	0	0	5	0	0	3	12	9	4	35	
	Deaths,	0	0	0	0	0	0	0	0	0	0	1	2	3	7.89
Monroe, ...	Totals,	0	2	0	0	0	0	2	3	0	0	0	1	8	
	Rec., ...	0	1	0	0	0	0	2	3	0	0	0	1	7	
	Deaths,	0	1	0	0	0	0	0	0	0	0	0	0	1	12.50
Montgomery, ...	Totals,	5	6	13	14	6	7	11	9	10	28	22	19	150	
	Rec., ...	4	5	13	13	5	7	9	9	7	25	22	19	138	
	Deaths,	1	1	0	1	1	0	2	0	3	3	0	0	12	8.
Montour, ..	Totals,	1	0	3	0	1	0	0	0	0	7	8	5	25	
	Rec., ...	0	0	3	0	1	0	0	0	0	7	8	5	24	
	Deaths,	1	0	0	0	0	0	0	0	0	0	0	0	1	4..

TABLE V.—Continued.

County.	Results.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.	Percentage.
Northampton, .	Totals,	5	14	12	13	8	3	10	11	20	25	25	19	165	
	Rec., ...	4	13	10	12	8	3	9	11	20	24	25	18	157	
	Deaths,	1	1	2	1	0	0	1	0	0	1	0	1	8	4.84
Northumberland,	Totals,	4	4	8	7	6	4	2	9	18	16	25	15	118	
	Rec., ...	4	4	8	6	6	3	2	9	17	15	23	12	109	
	Deaths,	0	0	0	1	0	1	0	0	1	1	2	3	9	7.62
Perry, ...	Totals,	7	0	1	3	0	1	0	0	1	2	0	4	19	
	Rec., ...	6	0	1	0	0	1	0	0	0	2	0	4	14	
	Deaths,	1	0	0	3	0	0	0	0	1	0	0	0	5	26.31
Pike, ...	Totals,	0	0	0	0	2	0	0	1	0	0	0	0	3	
	Rec., ...	0	0	0	0	2	0	0	1	0	0	0	0	3	
	Deaths,	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
Potter, ...	Totals,	0	0	1	1	1	1	2	0	0	0	1	3	10	
	Rec., ...	0	0	1	1	1	1	2	0	0	0	1	2	9	
	Deaths, .	0	0	0	0	0	0	0	0	0	0	0	1	1	10.
Schuylkill, .	Totals, ..	41	40	32	22	39	34	22	19	39	49	60	51	448	
	Rec., ...	39	37	29	20	37	28	19	17	36	42	55	45	404	
	Deaths.	2	3	3	2	2	6	3	2	3	7	5	6	44	9.82
Snyder, ...	Totals,	1	1	0	0	1	1	1	2	0	0	1	7	15	
	Rec., ...	1	1	0	0	1	1	1	2	0	0	1	7	15	
	Deaths,	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
Somerset, .	Totals,	2	2	6	2	0	1	3	5	9	14	25	14	83	
	Rec., ...	1	2	5	2	0	1	1	5	9	13	24	14	77	
	Deaths,	1	0	1	0	0	0	2	0	0	1	1	0	6	7.22
Sullivan, .	Totals,	0	0	2	0	1	1	2	0	2	0	3	2	13	
	Rec., ...	0	0	2	0	1	1	2	0	2	0	3	2	13	
	Deaths,	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
Susquehanna, ..	Totals,	1	1	0	1	1	1	0	1	0	1	0	1	8	
	Rec., ...	0	1	0	1	1	1	0	1	0	1	0	1	7	
	Deaths,	1	0	0	0	0	0	0	0	0	0	0	0	1	12.50
Tioga, ...	Totals,	1	2	0	1	0	0	5	0	2	5	4	3	23	
	Rec., ...	1	2	0	1	0	0	5	0	2	4	4	3	22	
	Deaths,	0	0	0	0	0	0	0	0	0	1	0	0	1	4.35
Union, ...	Totals,	0	0	0	0	0	0	0	0	1	0	0	0	1	
	Rec., ...	0	0	0	0	0	0	0	0	1	0	0	0	1	
	Deaths,	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
Venango, ..	Totals,	2	1	1	0	1	0	2	1	12	6	15	6	47	
	Rec., ...	2	1	1	0	1	0	2	1	12	6	15	6	47	
	Deaths,	0	0	0	0	0	0	0	0	0	0	0	0	0	0.

TABLE V.—Continued.

County	Results.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October	November.	December.	Total.	Percentage.
Warren, ..	Totals,	0	1	3	0	1	2	5	2	3	9	1	3	30	
	Rec., ...	0	1	3	0	1	2	5	2	3	9	1	2	29	
	Deaths, .	0	0	0	0	0	0	0	0	0	0	0	1	1	3.33
Washington,	Totals,	6	8	8	2	9	3	14	6	32	62	32	17	199	
	Rec., ...	5	7	8	2	8	3	14	5	29	56	31	14	182	
	Deaths,	1	1	0	0	1	0	0	1	3	6	1	3	17	8.54
Wayne, ...	Totals,	0	1	0	1	2	0	1	2	4	3	3	3	20	
	Rec., ...	0	1	0	1	2	0	1	2	4	3	3	3	20	
	Deaths,	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
Westmoreland, ...	Totals,	2	18	21	7	13	12	19	13	24	35	48	33	245	
	Rec., ...	1	16	20	5	12	12	18	13	23	32	45	32	229	
	Deaths,	1	2	1	2	1	0	1	0	1	3	3	1	16	6.53
Wyoming, .	Totals,	3	3	1	1	0	0	1	3	0	2	8	1	23	
	Rec., ...	3	3	1	1	0	0	1	3	0	2	8	1	23	
	Deaths,	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
York, ...	Totals,	50	14	24	11	6	7	4	9	8	13	15	21	182	
	Rec., ...	46	14	23	11	6	6	4	7	8	13	14	18	170	
	Deaths,	4	0	1	0	0	1	0	2	0	0	1	3	12	6.59
Total,	Cases, ...	....	....	....	....	....	....	....	....	....	....	....	....	7793	
	Deaths,	....	....	....	....	....	....	....	....	....	....	....	....	510	6.54

TABLE VI.

Antitoxin Treatment of Diphtheria for 1911.

Initial Dose 3,000 and 5,000 Units.

Result of Treatment of Diphtheria with Antitoxin According to Number of Units used and Period of Treatment after Onset of Disease.

Number of Units Used.	Results.	1st day.	2nd day.	3rd day.	4th day.	5th day.	6th day and over.	Total.	Percentage.
500, ...	Totals,	0	1	0	0	1	0	2	
	Rec., ...	0	1	0	0	1	0	2	
	Deaths,	0	0	0	0	0	0	0	0.

TABLE VI.—Continued.

Number of Units Used.	Results.	1st day.	2nd day.	3rd day.	4th day.	5th day.	6th day and over.	Total.	Percentage.
1,000, ...	Totals,	110	24	14	4	7	4	163	
	Rec., ...	107	20	12	4	3	3	149	
	Deaths,	3	4	2	0	4	1	14	8.58
2,000, ...	Totals,	66	17	5	1	0	0	89	
	Rec., ...	64	15	4	1	0	0	84	
	Deaths,	2	2	1	0	0	0	5	5.61
3,000, ...	Totals,	1338	417	128	47	23	35	1988	
	Rec., ...	1311	385	104	36	18	28	1882	
	Deaths,	27	32	24	11	5	7	106	5.33
4,000, ...	Totals,	116	30	24	4	2	2	178	
	Rec., ...	109	26	22	4	2	2	165	
	Deaths,	7	4	2	0	0	0	13	7.30
4,500, ...	Totals,	1	0	0	0	0	0	1	
	Rec., ...	1	0	0	0	0	0	1	
	Deaths,	0	0	0	0	0	0	0	0.
5,000, ...	Totals,	1041	357	108	41	20	20	1587	
	Rec., ...	1032	345	99	32	14	16	1538	
	Deaths,	9	12	9	9	6	4	49	3.08
5,500, ...	Totals,	1	0	0	0	0	0	1	
	Rec., ...	1	0	0	0	0	0	1	
	Deaths,	0	0	0	0	0	0	0	0.
6,000, ...	Totals,	820	300	115	30	22	23	1310	
	Rec., ...	795	274	103	18	17	15	1222	
	Deaths,	25	26	12	12	5	8	88	6.71
7,000, ...	Totals,	49	30	7	0	1	1	88	
	Rec., ...	46	27	6	0	1	1	81	
	Deaths,	3	3	1	0	0	0	7	7.95
7,500, ...	Totals,	2	0	1	0	0	0	3	
	Rec., ...	2	0	1	0	0	0	3	
	Deaths,	0	0	0	0	0	0	0	0.
8,000, ...	Totals,	45	26	10	3	1	0	85	
	Rec., ...	42	21	9	3	1	0	76	
	Deaths,	3	5	1	0	0	0	9	10.58
9,000, ...	Totals, ..	232	108	47	16	7	12	422	
	Rec., ..	217	94	42	13	6	10	382	
	Deaths,	15	14	5	3	1	2	40	9.47
10,000, ...	Totals,	416	195	66	24	13	13	727	
	Rec., ...	402	183	55	18	12	9	679	
	Deaths,	14	12	11	6	1	4	48	6.60
10,500, ...	Totals,	0	1	0	0	0	0	1	
	Rec., ...	0	0	0	0	0	0	0	
	Deaths,	0	1	0	0	0	0	1	100

TABLE VI.—Continued.

Number of Units Used.	Results.	1st day.	2nd day.	3rd day.	4th day.	5th day.	6th day and over.	Total.	Percentage.
11,000, ...	Totals,	40	13	8	3	3	0	67	
	Rec., ...	40	11	8	2	3	0	64	
	Deaths,	0	2	0	1	0	0	3	4.47
11,500, ...	Totals,	0	1	1	0	0	0	2	
	Rec., ...	0	1	1	0	0	0	2	
	Deaths,	0	0	0	0	0	0	0	0.
12,000, ...	Totals,	101	57	22	12	4	4	203	
	Rec., ...	93	51	18	8	4	3	177	
	Deaths,	11	6	4	4	0	1	26	12.80
12,500, ...	Totals,	1	0	0	1	0	0	2	
	Rec., ...	1	0	0	1	0	0	2	
	Deaths,	0	0	0	0	0	0	0	0.
13,000, ...	Totals,	21	8	6	2	1	0	38	
	Rec., ...	17	8	5	0	0	0	30	
	Deaths,	4	0	1	2	1	0	8	21.05
14,000, ...	Totals,	19	4	2	3	0	1	29	
	Rec., ...	19	4	2	3	0	1	29	
	Deaths,	0	0	0	0	0	0	0	0.
14,500, ...	Totals.	0	1	0	0	0	0	1	
	Rec., ...	0	1	0	0	0	0	1	
	Deaths,	0	0	0	0	0	0	0	0.
15,000, ...	Totals,	178	77	34	20	4	5	318	
	Rec., ...	171	71	30	12	2	3	289	
	Deaths,	7	6	4	8	2	2	29	9.11
16,000, ...	Totals,	10	7	1	3	0	0	21	
	Rec., ...	7	6	1	3	0	0	17	
	Deaths,	3	1	0	0	0	0	4	19.04
17,000, ...	Totals,	6	5	2	0	1	3	71	
	Rec., ...	6	3	2	0	1	2	14	
	Deaths,	0	2	0	0	0	1	3	17.64
18,000, ...	Totals,	21	18	16	1	1	0	57	
	Rec., ...	19	14	7	1	1	0	42	
	Deaths,	2	4	9	0	0	0	15	26.31
19,000, ...	Totals,	4	4	7	1	0	0	16	
	Rec., ...	4	3	5	1	0	0	13	
	Deaths,	0	1	2	0	0	0	3	18.75
20,000, ...	Totals,	72	30	19	9	2	3	135	
	Rec., ...	71	26	18	7	2	1	125	
	Deaths,	1	4	1	2	0	2	10	7.40
21,000, ...	Totals,	19	3	2	3	1	1	29	
	Rec., ...	16	3	2	3	1	1	26	
	Deaths,	3	0	0	0	0	0	3	10.34

TABLE VI.—Continued.

Number of Units Used.	Results.	1st day.	2nd day.	3rd day.	4th day.	5th day.	6th day and over.	Total.	Percentage.
22,000,	Totals,	5	4	1	0	1	0	11	
	Rec., ...	3	3	1	0	1	0	8	
	Deaths,	2	1	0	0	0	0	3	27.27
23,000,	Totals,	4	3	0	0	0	0	7	
	Rec., ...	4	3	0	0	0	0	7	
	Deaths,	0	0	0	0	0	0	0	0.
24,000,	Totals,	10	4	2	3	1	1	21	
	Rec., ...	8	4	2	2	1	1	18	
	Deaths,	2	0	0	1	0	0	3	14.28
25,000,	Totals,	25	14	6	2	1	1	49	
	Rec., ...	24	14	4	1	0	1	44	
	Deaths,	1	0	2	1	1	0	5	10.20
26,000,	Totals,	3	0	1	0	0	0	4	
	Rec., ...	2	0	1	0	0	0	3	
	Deaths,	1	0	0	0	0	0	1	25
27,000,	Totals,	5	4	1	2	0	0	12	
	Rec., ...	5	4	1	1	0	0	11	
	Deaths,	0	0	0	1	0	0	1	8.33
28,000,	Totals,	3	0	0	0	0	0	3	
	Rec., ...	3	0	0	0	0	0	3	
	Deaths,	0	0	0	0	0	0	0	0.
29,000,	Totals.	1	0	0	0	0	1	2	
	Rec., ...	1	0	0	0	0	1	2	
	Deaths,	0	0	0	0	0	0	0	0.
30,000,	Totals,	23	7	2	2	1	0	35	
	Rec., ...	22	7	1	1	1	0	32	
	Deaths,	1	0	1	1	0	0	3	8.57
31,000,	Totals,	1	2	0	0	0	0	3	
	Rec., ...	1	2	0	0	0	0	3	
	Deaths,	0	0	0	0	0	0	0	0.
32,000,	Totals,	0	0	0	0	0	1	1	
	Rec., ...	0	0	0	0	0	0	0	
	Deaths,	0	0	0	0	0	1	1	100
32,500,	Totals,	1	0	0	0	0	0	1	
	Rec., ...	0	0	0	0	0	0	0	
	Deaths,	1	0	0	0	0	0	1	100
33,000,	Totals,	3	1	1	0	0	0	5	
	Rec., ...	2	1	1	0	0	0	4	
	Deaths,	1	0	0	0	0	0	1	20

TABLE VI.—Continued.

Number of Units Used.	Results.	1st day.	2nd day.	3rd day.	4th day.	5th day.	6th day and over.	Total.	Percentage.
34,000, ...	Totals,	2	2	0	0	0	0	4	
	Rec., ...	2	2	0	0	0	0	4	
	Deaths.	0	0	0	0	0	0	0	0.
35,000, ...	Totals,	5	1	0	0	0	0	6	
	Rec., ...	4	1	0	0	0	0	5	
	Deaths.	1	0	0	0	0	0	1	16.66
36,000, ...	Totals,	3	2	2	0	0	1	8	
	Rec., ...	3	2	2	0	0	1	8	
	Deaths,	0	0	0	0	0	0	0	0.
37,000, ...	Totals,	2	0	0	0	0	0	2	
	Rec., ...	1	0	0	0	0	0	1	
	Deaths,	1	0	0	0	0	0	1	50
38,000, ...	Totals,	0	1	0	0	0	0	1	
	Rec., ...	0	1	0	0	0	0	1	
	Deaths,	0	0	0	0	0	0	0	0.
39,000, ...	Totals,	0	0	1	0	0	0	1	
	Rec., ...	0	0	1	0	0	0	1	
	Deaths,	0	0	0	0	0	0	0	0.
40,000, ...	Totals,	2	1	2	0	1	0	6	
	Rec., ...	2	1	2	0	1	0	6	
	Deaths,	0	0	0	0	0	0	0	0.
42,000, ...	Totals,	0	1	0	0	0	0	1	
	Rec., ...	0	0	0	0	0	0	0	
	Deaths.	0	1	0	0	0	0	1	100
45,000, ...	Totals,	3	1	0	0	0	1	5	
	Rec., ...	3	0	0	0	0	1	4	
	Deaths,	0	1	0	0	0	0	1	20
46,000, ...	Totals,	0	2	0	0	0	0	2	
	Rec., ...	0	1	0	0	0	0	1	
	Deaths,	0	1	0	0	0	0	1	50
47,000, ...	Totals,	1	0	0	0	0	0	1	
	Rec.. ..	1	0	0	0	0	0	1	
	Deaths,	0	0	0	0	0	0	0	0.
48,000, ...	Totals,	1	0	0	0	0	0	1	
	Rec., ...	1	0	0	0	0	0	1	
	Deaths.	0	0	0	0	0	0	0	0.
50,000, ...	Totals,	1	0	0	1	0	0	2	
	Rec., ...	1	0	0	1	0	0	2	
	Deaths,	0	0	0	0	0	0	0	0.

TABLE VI.—Continued.

Number of Units Used.	Results.	1st day.	2nd day.	3rd day.	4th day.	5th day.	6th day and over.	Total.	Per centage.
54,000, ...	Totals,	1	0	0	0	0	0	1	
	Rec., ...	1	0	0	0	0	0	1	
	Deaths,	0	0	0	0	0	0	0	0.
55,000, ...	Totals,	3	0	0	0	0	1	4	
	Rec., ...	3	0	0	0	0	1	4	
	Deaths,	0	0	0	0	0	0	0	0.
56,000, ...	Totals,	0	1	0	0	0	0	1	
	Rec., ...	0	1	0	0	0	0	1	
	Deaths,	0	0	0	0	0	0	0	0.
59,000, ...	Totals,	1	0	0	0	0	0	1	
	Rec., ...	1	0	0	0	0	0	1	
	Deaths,	0	0	0	0	0	0	0	0.
60,000, ...	Totals,	2	1	0	0	0	0	3	
	Rec., ...	2	1	0	0	0	0	3	
	Deaths,	0	0	0	0	0	0	0	0.
65,000, ...	Totals,	1	1	0	0	0	0	2	
	Rec., ...	1	1	0	0	0	0	2	
	Deaths,	0	0	0	0	0	0	0	0.
74,000, ...	Totals,	1	0	0	0	0	0	1	
	Rec., ...	1	0	0	0	0	0	1	
	Deaths,	0	0	0	0	0	0	0	0.
80,000, ...	Totals,	0	1	0	0	0	0	1	
	Rec., ...	0	1	0	0	0	0	1	
	Deaths,	0	0	0	0	0	0	0	0.
83,500, ...	Totals,	0	0	1	0	0	0	1	
	Rec., ...	0	0	0	0	0	0	0	
	Deaths,	0	0	1	0	0	0	1	100
90,000, ...	Totals,	0	0	0	0	0	1	1	
	Rec., ...	0	0	0	0	0	1	1	
	Deaths,	0	0	0	0	0	0	0	0.
93,000, ...	Totals,	0	1	0	0	0	0	1	
	Rec., ...	0	1	0	0	0	0	1	
	Deaths,	0	0	0	0	0	0	0	0.
115,000, ...	Totals,	1	0	0	0	0	0	1	
	Rec., ...	0	0	0	0	0	0	0	
	Deaths,	1	0	0	0	0	0	1	100
120,000, ...	Totals,	1	0	0	0	0	0	1	
	Rec., ...	1	0	0	0	0	0	1	
	Deaths,	0	0	0	0	0	0	0	0.

TABLE VII.

Antitoxin Treatment of Diphtheria for 1911.

Initial dose 3,000 and 5,000 units.

Statement Showing Cases where Subsequent Treatments with Antitoxin Were Made after the First 24 hours.

Results.	Number of Cases.	Units Used.	Results.	Number of Cases.	Units Used.
Totals,	1	250	Totals,	1	7,500
Rec.,	1		Rec.,	1	
Deaths,	0		Deaths,	0	
Totals,	112	1,000	Totals,	34	8,000
Rec.,	104		Rec.,	33	
Deaths,	8		Deaths,	1	
Totals,	1	1,500	Totals,	1	8,500
Rec.,	1		Rec.,	1	
Deaths,	0		Deaths,	0	
Totals,	45	2,000	Totals,	124	9,000
Rec.,	45		Rec.,	111	
Deaths,	0		Deaths,	13	
Totals,	2	2,500	Totals,	232	10,000
Rec.,	2		Rec.,	216	
Deaths,	0		Deaths,	16	
Totals,	849	3,000	Totals,	20	11,000
Rec.,	786		Rec.,	18	
Deaths,	63		Deaths,	2	
Totals,	44	4,000	Totals,	76	12,000
Rec.,	40		Rec.,	59	
Deaths,	4		Deaths,	17	
Totals,	1	4,500	Totals,	8	13,000
Rec.,	1		Rec.,	7	
Deaths,	0		Deaths,	1	
Totals,	561	5,000	Totals,	10	14,000
Rec.,	521		Rec.,	9	
Deaths.	40		Deaths,	1	
Totals,	1	5,500	Totals,	109	15,000
Rec.,	0		Rec.,	96	
Deaths,	1		Deaths,	13	
Totals,	353	6,000	Totals,	7	16,000
Rec.,	313		Rec.,	6	
Deaths,	40		Deaths,	1	
Totals,	30	7,000	Totals,	6	17,000
Rec.,	25		Rec.,	4	
Deaths,	5		Deaths,	2	

TABLE VII—Continued (2)

Results.	Number of Cases.	Units Used.	Results.	Number of Cases.	Units Used.
Totals,	22	18,000	Totals,	3	32,000
Rec.,	20		Rec.,	3	
Deaths,	2		Deaths,	0	
Totals,	3	19,000	Totals,	4	33,000
Rec.,	3		Rec.,	4	
Deaths,	0		Deaths,	0	
Totals,	37	20,000	Totals,	4	35,000
Rec.,	32		Rec.,	4	
Deaths,	5		Deaths,	0	
Totals,	4	21,000	Totals,	2	36,000
Rec.,	4		Rec.,	2	
Deaths,	0		Deaths,	0	
Totals,	3	22,000	Totals,	1	39,000
Rec.,	2		Rec.,	1	
Deaths,	1		Deaths,	0	
Totals,	4	23,000	Totals,	3	40,000
Rec.,	4		Rec.,	2	
Deaths,	0		Deaths,	1	
Totals,	4	24,000	Totals,	1	41,000
Rec.,	4		Rec.,	0	
Deaths,	0		Deaths,	1	
Totals,	13	25,000	Totals,	3	45,000
Rec.,	11		Rec.,	3	
Deaths,	2		Deaths,	0	
Totals,	1	26,000	Totals,	1	49,000
Rec.,	1		Rec.,	1	
Deaths,	0		Deaths,	0	
Totals,	4	27,000	Totals,	3	50,000
Rec.,	4		Rec.,	3	
Deaths,	0		Deaths,	0	
Totals,	2	28,000	Totals,	2	55,000
Rec.,	1		Rec.,	2	
Deaths,	1		Deaths,	0	
Totals,	2	29,000	Totals,	1	60,000
Rec.,	2		Rec.,	1	
Deaths,	0		Deaths,	0	
Totals,	15	30,000	Totals,	1	69,000
Rec.,	12		Rec.,	1	
Deaths,	3		Deaths,	0	
Totals,	2	31,000	Totals,	1	70,000
Rec.,	1		Rec.,	0	
Deaths,	1		Deaths,	0	

TABLE VII—Continued.

Results.	Number of Cases.	Units Used.	Results.	Number of Cases.	Units Used.
Totals,	1	79,000	Totals,	1	105,000
Rec.,	0		Rec.,	0	
Deaths,	1		Deaths,	1	
Totals,	1	85,000	Totals,	1	110,000
Rec.,	1		Rec.,	1	
Deaths,	0		Deaths,	0	
Totals,	1	88,000			
Rec.,	1				
Deaths,	0				

TABLE I.

Antitoxin Treatment of Diphtheria for 1911.

Initial Dose, 5,000 units.

Relation of Initial Treatment to time of Onset.

	1st day.	2nd day.	3rd day.	4th day.	5th day.	6th day and over.	Total.
Totals,	1,712	673	228	98	44	38	2,793
Recoveries,	1,688	642	204	73	36	29	2,672
Deaths,	24	31	24	25	8	9	121
Percentage of deaths,	1.40	4.60	10.52	25.51	18.18	23.68	4.33

TABLE II.

Antitoxin Treatment of Diphtheria for 1911.

Initial Dose, 5,000 units.

Result of Treatment of Diphtheria with Antitoxin With Relation to Sex and Age.

Results.	Age Periods.											
	Sex	0-1	1-2	2-3	3-4	4-5	5-9	10-14	15-	20+	Total.	
Totals,	M.	14	48	92	116	173	553	172	57	86	1,311	
	F.	18	45	75	118	138	564	213	103	208	1,482	2,793
Recoveries,	M.	13	42	82	106	165	532	168	57	84	1,249	
	F.	18	41	63	112	132	547	204	100	206	1,423	2,672
Deaths,	M.	1	6	10	10	8	21	4	0	2	62	
	F.	0	4	12	6	6	17	9	3	2	59	121

TABLE III.

Result of Treatment of Diphtheria with Antitoxin According to Period of Initial Treatment after Onset, and Age.

Antitoxin Treatment of Diphtheria for 1911, Initial Dose 5000 Units.

Period of Treatment.	Results.	Age Periods.									Total.	Per centage.
		0-1	1-2	2-3	3-4	4-5	5-9	10-14	15-19	20+		
1st day, ...	Totals, ...	18	52	100	133	185	692	252	80	200	1,712	
	Rec., ...	18	50	96	132	183	686	246	79	198	1,688	
	Deaths, ...	0	2	4	1	2	6	6	1	2	24	1.40
2nd day, ...	Totals, ...	12	19	39	55	67	275	89	50	67	673	
	Rec., ...	11	17	35	48	66	262	88	48	67	642	
	Deaths, ...	1	2	4	7	1	13	1	2	0	31	4.60
3rd day, ...	Totals, ...	2	12	22	27	25	86	23	18	13	228	
	Rec., ...	2	11	16	24	20	79	21	18	13	204	
	Deaths, ...	0	1	6	3	5	7	2	0	0	24	10.52
4th day, ...	Totals, ...	0	6	7	10	18	32	12	7	6	98	
	Rec., ...	0	2	5	5	14	25	10	7	5	73	
	Deaths, ...	0	4	2	5	4	7	2	0	1	25	25.51
5th day, ...	Totals, ...	0	1	5	4	3	18	4	3	6	44	
	Rec., ...	0	1	1	4	2	17	2	3	6	36	
	Deaths, ...	0	0	4	0	1	1	2	0	0	8	18.18
6th day and over, ...	Totals, ...	0	3	4	5	3	14	5	2	2	38	
	Rec., ...	0	2	2	5	2	10	5	2	1	29	
	Deaths, ...	0	1	2	0	1	4	0	0	1	9	23.68
	Total treatments,	....	....	....	....	....	....	....	....	....	2,793	
	Total deaths, ...	....	....	....	....	....	....	....	....	....	121	4.33

TABLE IV.

Antitoxin Treatment of Diphtheria for 1911.

Initial Dose, 5,000 units.

Result of Treatment of Diphtheria with Antitoxin According to Areas Affected and Period of Initial Treatment after Onset of Disease.

Area.	Results.	Period Within Which Initial Treatment Was Made.						Total.	Percentage.
		1st day.	2nd day.	3rd day.	4th day.	5th day.	6th day and over.		
Post nasal, ...	Totals,	24	11	4	2	0	1	42	
	Rec., ...	24	11	3	2	0	1	41	
	Deaths,	0	0	1	0	0	0	1	2.38
Pharyngeal, ...	Totals,	38	19	3	4	0	0	64	
	Rec., ...	38	19	2	4	0	0	63	
	Deaths,	0	0	1	0	0	0	1	1.56
Tonsillar, ...	Totals,	825	257	62	16	7	11	1178	
	Rec., ...	824	256	60	14	7	10	1171	
	Deaths,	1	1	2	2	0	1	7	.59
Laryngeal, ...	Totals,	144	55	26	13	6	6	250	
	Rec., ...	137	48	24	9	4	4	226	
	Deaths,	7	7	2	4	2	2	24	9.60
All combined, ...	Totals,..	20	9	5	5	2	0	41	
	Rec., ...	18	8	2	3	1	0	32	
	Deaths,	2	1	3	2	1	0	9	21.95
Pn. and Phar., ...	Totals,	8	10	3	0	0	0	21	
	Rec., ...	8	8	2	0	0	0	18	
	Deaths,	0	2	1	0	0	0	3	14.28
Pn., Phar., Ton., ...	Totals,	103	46	34	20	9	8	220	
	Rec., ...	99	43	28	14	7	5	196	
	Deaths,	4	3	6	6	2	3	24	10.90
Pn., Ton., Lar., ...	Totals,	1	4	4	2	0	2	13	
	Rec., ...	1	3	4	1	0	2	11	
	Deaths,	0	1	0	1	0	0	2	15.38
Pn. and Lar., ...	Totals,	5	6	0	1	1	0	13	
	Rec., ...	5	6	0	0	1	0	12	
	Deaths,	0	0	0	1	0	0	1	7.69
Ton. and Lar., ...	Totals,	19	15	13	8	3	1	59	
	Rec., ...	18	14	11	6	1	0	50	
	Deaths,	1	1	2	2	2	1	9	15.25
Ph., Ton., Lar., ...	Totals,	46	16	10	9	2	0	83	
	Rec., ...	42	13	8	5	2	0	70	
	Deaths,	4	3	2	4	0	0	13	15.65

TABLE IV—Continued (5,000 units).

Area.	Results.	Period Within Which Initial Treatment Was Made.						Total.	Percentage.
		1st day.	2nd day.	3rd day.	4th day.	5th day.	6th day and over.		
Ph. and Ton.,	Totals,	317	157	44	13	8	3	542	
	Rec., ...	315	154	42	12	7	3	533	
	Deaths,	2	3	2	1	1	0	9	1.66
Pn. and Ton.,	Totals,	114	42	12	5	6	2	181	
	Rec., ...	113	37	11	3	6	1	171	
	Deaths,	1	5	1	2	0	1	10	5.52
Ph. and Lar.,	Totals,	36	20	7	0	0	4	67	
	Rec., ...	34	17	6	0	0	3	60	
	Deaths,	2	3	1	0	0	1	7	10.44
Pn., Ph., Lar.,	Totals,	12	6	1	0	0	0	19	
	Rec., ...	12	5	1	0	0	0	18	
	Deaths,	0	1	0	0	0	0	1	5.26
Total,	Cases, ..	......	......	......	......	......	......	2,793	
	Deaths,	......	......	......	......	......	......	121	4.33

TABLE V.

Antitoxin Treatment of Diphtheria for 1911.

Initial Dose, 5,000 units.

Result of Treatment of Diphtheria with Antitoxin in the several Counties by the Months.

County.	Results.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.	Per cent.
Adams, ...	Totals,	3	1	0	0	0	0	0	0	0	0	0	1	5	
	Rec., ...	3	1	0	0	0	0	0	0	0	0	0	1	5	
	Deaths,	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
Allegheny, .	Totals,	18	6	10	7	14	9	6	11	34	68	105	88	376	
	Rec., ...	18	6	10	7	14	9	6	10	33	65	102	86	366	
	Deaths,	0	0	0	0	0	0	0	1	1	3	3	2	10	2.65
Armstrong,	Totals,	1	0	0	0	0	0	0	1	0	0	3	2	7	
	Rec., ...	1	0	0	0	0	0	0	1	0	0	1	2	5	
	Deaths,	0	0	0	0	0	0	0	0	0	0	2	0	2	28.57

TABLE V—Continued.

County.	Results.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.	Per cent.
Beaver, ...	Totals,	0	0	0	0	0	0	0	0	0	1	8	4	13	
	Rec., ...	0	0	0	0	0	0	0	0	0	1	8	4	13	
	Deaths,	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
Bedford, ...	Totals,	1	0	0	0	0	0	0	0	0	0	1	0	2	
	Rec., ...	1	0	0	0	0	0	0	0	0	0	1	0	2	
	Deaths,	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
Blair.	Totals,	13	3	7	4	5	2	4	1	1	13	12	10	75	
	Rec., ...	13	3	7	4	5	2	4	1	1	13	12	9	74	
	Deaths,	0	0	0	0	0	0	0	0	0	0	0	1	1	1.33
Bradford, .	Totals,	0	0	0	0	0	0	0	0	0	1	0	0	1	
	Rec., ...	0	0	0	0	0	0	0	0	0	1	0	0	1	
	Deaths,	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
Berks, ...	Totals,	2	7	7	13	6	1	8	10	7	18	15	17	111	
	Rec., ...	2	7	7	11	5	1	6	9	7	15	13	17	100	
	Deaths,	0	0	0	2	1	0	2	1	0	3	2	0	11	9.91
Bucks, ...	Totals,	5	6	3	3	2	2	1	0	2	0	2	6	32	
	Rec., ...	5	6	3	2	2	2	1	0	2	0	2	6	31	
	Deaths,	0	0	0	1	0	0	0	0	0	0	0	0	1	3.12
Butler, ...	Totals,	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Rec., ...	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Deaths,	0	0	0	0	0	0	0	0	0	0	0	0	0	
Cambria, .	Totals,	6	0	5	2	0	1	2	8	7	6	11	7	55	
	Rec., ...	6	0	5	2	0	1	2	8	7	5	10	6	52	
	Deaths,	0	0	0	0	0	0	0	0	0	1	1	1	3	5.45
Cameron, .	Totals,	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Rec., ...	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Deaths,	0	0	0	0	0	0	0	0	0	0	0	0	0	
Carbon, ...	Totals,	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Rec., ...	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Deaths,	0	0	0	0	0	0	0	0	0	0	0	0	0	
Centre, ...	Totals,	0	1	0	0	0	0	0	0	0	0	0	0	1	
	Rec., ...	0	1	0	0	0	0	0	0	0	0	0	0	1	
	Deaths,	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
Chester, ...	Totals,	1	2	0	1	1	0	0	0	0	0	0	1	6	
	Rec., ...	1	2	0	1	1	0	0	0	0	0	0	0	5	
	Deaths,	0	0	0	0	0	0	0	0	0	0	0	1	1	16.66
Clarion, ...	Totals,	1	0	0	0	0	0	0	0	0	0	0	0	1	
	Rec., ...	1	0	0	0	0	0	0	0	0	0	0	0	1	
	Deaths,	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
Clearfield, .	Totals,	0	0	0	0	0	0	2	2	4	4	9	13	34	
	Rec., ...	0	0	0	0	0	0	1	2	3	4	9	13	32	
	Deaths,	0	0	0	0	0	0	1	0	1	0	0	0	2	5.88

TABLE V—Continued.

County.	Results.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.	Per cent.
Clinton, ...	Totals,	0	0	0	0	0	0	0	0	0	1	0	0	1	
	Rec., ...	0	0	0	0	0	0	0	0	0	1	0	0	1	
	Deaths,	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
Columbia, .	Totals,	0	0	0	0	0	0	1	0	0	0	0	1	2	
	Rec., ...	0	0	0	0	0	0	1	0	0	0	0	1	2	
	Deaths,	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
Crawford, .	Totals,	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Rec., ...	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Deaths,	0	0	0	0	0	0	0	0	0	0	0	0	0	
Cumberland, ...	Totals,	1	0	2	0	0	0	0	2	0	7	2	5	19	
	Rec., ...	0	0	2	0	0	0	0	2	0	7	1	4	16	
	Deaths,	1	0	0	0	0	0	0	0	0	0	1	1	3	15.78
Dauphin. ..	Totals	24	21	24	43	40	19	22	19	49	72	88	53	474	
	Rec., ...	23	21	23	42	38	17	22	19	46	70	85	52	458	
	Deaths,	1	0	1	1	2	2	0	0	3	2	3	1	16	3.38
Delaware,	Totals,	3	1	0	1	0	0	2	0	1	1	4	1	14	
	Rec., ...	3	1	0	1	0	0	2	0	1	1	3	1	13	
	Deaths,	0	0	0	0	0	0	0	0	0	0	1	0	1	7.14
Elk, ...	Totals,	1	0	0	0	4	5	3	0	5	1	4	5	28	
	Rec., ...	1	0	0	0	3	5	3	0	5	1	4	5	27	
	Deaths,	0	0	0	0	1	0	0	0	0	0	0	0	1	3.57
Erie, ...	Totals,	4	0	10	7	3	6	5	9	5	3	10	11	73	
	Rec., ...	4	0	10	7	3	6	5	9	4	3	8	11	70	
	Deaths,	0	0	0	0	0	0	0	0	1	0	2	0	3	4.10
Fayette, ...	Totals,	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Rec., ...	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Deaths,	0	0	0	0	0	0	0	0	0	0	0	0	0	
Forest, ...	Totals,	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Rec., ...	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Deaths,	0	0	0	0	0	0	0	0	0	0	0	0	0	
Franklin, ..	Totals,	0	0	0	0	0	0	0	0	0	1	1	3	5	
	Rec., ...	0	0	0	0	0	0	0	0	0	1	1	3	5	
	Deaths,	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
Fulton, ...	Totals,	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Rec., ...	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Deaths,	0	0	0	0	0	0	0	0	0	0	0	0	0	
Greene, ...	Totals,	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Rec., ...	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Deaths,	0	0	0	0	0	0	0	0	0	0	0	0	0	
Huntingdon,	Totals,	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Rec., ...	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Deaths,	0	0	0	0	0	0	0	0	0	0	0	0	0	

TABLE V—Continued.

County.	Results.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.	Per cent.
Indiana, ...	Totals,	1	1	4	0	0	4	2	0	0	4	1	3	20	
	Rec., ...	1	0	4	0	0	4	2	0	0	4	1	3	19	
	Deaths,	0	1	0	0	0	0	0	0	0	0	0	0	1	5.
Jefferson, .	Totals,	0	0	0	0	0	0	0	0	1	0	2	3	6	
	Rec., ...	0	0	0	0	0	0	0	0	1	0	2	3	6	
	Deaths,	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
Juniata, ..	Totals,	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Rec., ...	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Deaths,	0	0	0	0	0	0	0	0	0	0	0	0	0	
Lackawanna, .	Totals,	14	19	19	27	7	11	7	22	21	37	34	29	247	
	Rec., ...	14	18	19	26	7	10	7	21	21	35	34	29	241	
	Deaths,	0	1	0	1	0	1	0	1	0	2	0	0	6	2.42
Lancaster, .	Totals.	0	0	0	0	0	0	0	0	0	1	0	0	1	
	Rec., .	0	0	0	0	0	0	0	0	0	1	0	0	1	
	Deaths,	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
Lawrence, .	Totals,	7	3	1	1	3	15	13	31	58	115	51	45	3 3	
	Rec., ...	7	3	0	1	2	15	12	31	56	112	51	40	330	
	Deaths,	0	0	1	0	1	0	1	0	2	3	0	5	13	3.79
Lebanon, .	Totals,	11	13	3	1	3	7	1	7	20	59	30	21	176	
	Rec., ...	9	13	3	1	3	7	1	6	20	57	27	21	168	
	Deaths,	2	0	0	0	0	0	0	1	0	2	3	0	8	4.54
Lehigh, ...	Totals,	7	1	21	4	9	12	6	8	13	19	13	20	144	
	Rec., ...	7	6	17	4	9	12	6	8	13	18	18	19	137	
	Deaths,	0	1	4	0	0	0	0	0	0	1	0	1	7	4.86
Luzerne, ...	Totals,	1	0	2	0	2	9	0	2	7	17	9	5	54	
	Rec., ...	1	0	2	0	2	9	0	2	7	17	7	5	52	
	Deaths,	0	0	0	0	0	0	0	0	0	0	2	0	2	3.70
Lycoming, .	Totals,	0	1	3	2	1	0	1	1	1	3	1	1	15	
	Rec., ...	0	0	3	2	1	0	1	1	1	3	0	1	13	
	Deaths,	0	1	0	0	0	0	0	0	0	0	1	0	2	13.33
McKean, ..	Totals,	0	0	0	0	0	0	0	1	0	0	0	0	1	
	Rec., ...	0	0	0	0	0	0	0	1	0	0	0	0	1	
	Deaths,	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
Mercer, ...	Totals.	0	1	0	1	0	0	0	0	0	2	2	3	9	
	Rec., ...	0	1	0	1	0	0	0	0	0	2	2	3	9	
	Deaths,	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
Mifflin, ...	Totals,	1	0	0	0	0	4	0	0	1	6	8	5	25	
	Rec., ...	1	0	0	0	0	4	0	0	1	6	8	3	23	
	Deaths,	0	0	0	0	0	0	0	0	0	0	0	2	2	8.
Monroe, ...	Totals,	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Rec., ...	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Deaths,	0	0	0	0	0	0	0	0	0	0	0	0	0	

TABLE V.—Continued.

County.	Results.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.	Per cent.
Montgomery, ...	Totals,	0	0	1	2	0	0	0	1	0	2	0	1	7	
	Rec., ...	0	0	1	2	0	0	0	1	0	2	0	1	7	
	Deaths,	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
Montour, ..	Totals,	0	0	0	0	0	0	0	0	0	1	3	4	8	
	Rec., ...	0	0	0	0	0	0	0	0	0	1	3	4	8	
	Deaths,	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
Northampton, .	Totals,	0	1	2	0	2	1	1	2	5	0	5	2	21	
	Rec., ...	0	1	2	0	2	1	1	2	5	0	5	2	21	
	Deaths,	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
Northumberland,	Totals,	1	1	0	2	2	0	0	0	7	7	10	5	35	
	Rec., ...	1	1	0	2	2	0	0	0	6	7	10	5	34	
	Deaths,	0	0	0	0	0	0	0	0	1	0	0	0	1	2.85
Perry, ...	Totals,	6	0	0	0	0	0	0	0	0	0	0	1	7	
	Rec., ..	5	0	0	0	0	0	0	0	0	0	0	1	6	
	Deaths,	1	0	0	0	0	0	0	0	0	0	0	0	1	14.28
Pike, ...	Totals,	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Rec., ...	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Deaths,	0	0	0	0	0	0	0	0	0	0	0	0	0	
Potter, ...	Totals,	0	0	0	0	0	0	0	0	0	0	0	3	3	
	Rec., ...	0	0	0	0	0	0	0	0	0	0	0	2	2	
	Deaths,	0	0	0	0	0	0	0	0	0	0	0	1	1	33.33
Schuylkill,	Totals,	24	9	6	3	9	5	4	6	7	16	10	20	119	
	Rec., ...	23	9	6	3	9	5	3	5	7	16	8	19	113	
	Deaths,	1	0	0	0	0	0	1	1	0	0	2	1	6	5.04
Snyder, ...	Totals,	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Rec., ...	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Deaths,	0	0	0	0	0	0	0	0	0	0	0	0	0	
Somerset, .	Totals,	0	0	0	0	0	0	0	0	0	0	0	1	1	
	Rec., ...	0	0	0	0	0	0	0	0	0	0	0	1	1	
	Deaths,	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
Sullivan, ..	Totals,	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Rec., ...	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Deaths,	0	0	0	0	0	0	0	0	0	0	0	0	0	
Susquehanna, ...	Totals,	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Rec., ...	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Deaths,	0	0	0	0	0	0	0	0	0	0	0	0	0	
Tioga, ...	Total,	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Rec., ...	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Deaths,	0	0	0	0	0	0	0	0	0	0	0	0	0	

TABLE V.—Continued.

County.	Results.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.	Per cent.
Union, ...	Totals	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Rec., ...	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Deaths,	0	0	0	0	0	0	0	0	0	0	0	0	0	
Venango, ..	Totals,	0	0	0	0	0	0	0	0	7	0	1	0	8	
	Rec., ...	0	0	0	0	0	0	0	0	7	0	1	0	8	
	Deaths,	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
Warren, ...	Totals,	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Rec., ...	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Deaths,	0	0	0	0	0	0	0	0	0	0	0	0	0	
Washington,	Totals,	3	3	2	0	6	0	4	1	3	11	6	4	43	
	Rec., ...	3	3	2	0	5	0	4	1	2	10	6	2	38	
	Deaths,	0	0	0	0	1	0	0	0	1	1	0	2	5	11.62
Wayne, ...	Totals,	0	0	0	0	0	0	0	2	3	1	4	0	10	
	Rec., ...	0	0	0	0	0	0	0	2	3	1	4	0	10	
	Deaths,	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
Westmoreland, ...	Totals,	0	1	0	0	1	1	1	0	3	5	7	4	23	
	Rec., ...	0	1	0	0	0	1	1	0	3	5	7	4	22	
	Deaths,	0	0	0	0	1	0	0	0	0	0	0	0	0	4.35
Wyoming, .	Totals,	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Rec., ...	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Deaths,	0	0	0	0	0	0	0	0	0	0	0	0	0	
York, ...	Totals,	46	11	17	3	5	6	3	7	5	7	10	12	132	
	Rec., ...	43	11	16	3	5	5	3	5	5	7	10	9	122	
	Deaths,	3	0	1	0	0	1	0	2	0	0	0	3	10	7.57
Total, ..	Cases, ..	....	....	....	....	....	....	....	....	....	....	....	....	2793	
	Deaths,	....	....	....	....	....	....	....	....	....	....	....	....	121	4.33

TABLE VI.

Antitoxin Treatment of Diphtheria for 1911.

Initial Dose, 5,000 units.

Result of Treatment of Diphtheria with Antitoxin According to Number of Units used and Period of Treatment After Onset of Disease.

Number of Units.	Results.	1st day.	2nd day.	3rd day.	4th day.	5th day.	6th day and over.	Total.	Percentage.
5,000,	Totals,	970	341	100	38	19	18	1486	
	Rec., ...	966	332	92	29	14	14	1447	
	Deaths,	4	9	8	9	5	4	39	2.62
6,000,	Totals,	17	6	2	0	0	2	27	
	Rec., ...	17	5	2	0	0	2	26	
	Deaths,	0	1	0	0	0	0	1	3.70
7,000,	Totals,	8	3	1	0	0	0	12	
	Rec., ...	8	3	1	0	0	0	12	
	Deaths,	0	0	0	0	0	0	0	0.
7,500,	Totals,	1	0	0	0	0	0	1	
	Rec., ...	1	0	0	0	0	0	1	
	Deaths,	0	0	0	0	0	0	0	0.
8,000,	Totals,	16	12	5	1	1	0	35	
	Rec., ...	16	12	4	1	1	0	34	
	Deaths,	0	0	1	0	0	0	1	2.85
9,000,	Totals,	2	2	1	0	0	0	5	
	Rec., ...	2	2	1	0	0	0	5	
	Deaths,	0	0	0	0	0	0	0	0.
10,000,	Totals,	383	183	56	24	12	11	669	
	Rec., ...	373	172	48	18	11	8	630	
	Deaths,	10	11	8	6	1	3	39	5.82
10,500,	Totals,	0	1	0	0	0	0	1	
	Rec., ...	0	0	0	0	0	0	0	
	Deaths,	0	1	0	0	0	0	1	100.
11,000,	Totals,	19	5	6	1	2	0	33	
	Rec., ...	19	4	6	1	2	0	32	
	Deaths,	0	1	0	0	0	0	1	3.03
12,000,	Totals,	0	3	1	1	0	0	5	
	Rec., ...	0	3	1	1	0	0	5	
	Deaths,	0	0	0	0	0	0	0	0.
12,500,	Totals,	1	0	0	0	0	0	1	
	Rec., ...	1	0	0	0	0	0	1	
	Deaths,	0	0	0	0	0	0	0	0.

TABLE VI—Continued.

Number of Units.	Results.	1st day.	2nd day.	3rd day.	4th day.	5th day.	6th day and over.	Total.	Percentage.
13,000,	Totals,	5	2	3	0	0	0	10	
	Rec., ...	4	2	2	0	0	0	8	
	Deaths,	1	0	1	0	0	0	2	20.
14,000,	Totals,	6	0	1	1	0	0	8	
	Rec., ...	6	0	1	1	0	0	8	
	Deaths,	0	0	0	0	0	0	0	0.
15,000,	Totals,	137	49	19	15	2	2	224	
	Rec., ...	134	49	19	10	1	1	214	
	Deaths,	3	0	0	5	1	1	10	4.46
16,000,	Totals,	2	3	0	2	0	0	7	
	Rec., ...	1	3	0	2	0	0	6	
	Deaths,	1	0	0	0	0	0	1	14.28
17,000,	Totals,	1	2	0	0	0	0	3	
	Rec., ...	1	2	0	0	0	0	3	
	Deaths,	0	0	0	0	0	0	0	0.
18,000,	Totals,	4	1	1	0	1	0	7	
	Rec., ...	4	1	1	0	1	0	7	
	Deaths,	0	0	0	0	0	0	0	0.
19,000,	Totals,	3	1	2	0	0	0	6	
	Rec., ...	3	1	1	0	0	0	5	
	Deaths,	0	0	1	0	0	0	1	16.66
20,000,	Totals,	67	31	16	9	2	1	126	
	Rec., ...	67	26	15	7	2	0	117	
	Deaths,	0	5	1	2	0	1	9	7.14
21,000,	Totals,	2	0	0	0	1	0	3	
	Rec.. ...	2	0	0	0	1	0	3	
	Deaths,	0	0	0	0	0	0	0	0.
22,000,	Totals,	1	0	0	0	1	0	2	
	Rec., ...	0	0	0	0	1	0	1	
	Deaths,	1	0	0	0	0	0	1	50.
23,000,	Totals,	3	1	0	0	0	0	4	
	Rec., ...	3	1	0	0	0	0	4	
	Deaths.	0	0	0	0	0	0	0	0.
24,000,	Totals,	0	0	1	0	0	0	1	
	Rec., ...	0	0	1	0	0	0	1	
	Deaths,	0	0	0	0	0	0	0	0.
25,000,	Totals,	23	13	7	2	1	1	47	
	Rec., ...	22	12	5	1	0	1	41	
	Deaths.	1	1	2	1	1	0	6	12.76

TABLE VI—Continued.

Number of Units.	Results.	1st day.	2nd day.	3rd day.	4th day.	5th day.	6th day and over.	Total.	Percentage.
26,000,	Totals,	1	0	1	0	0	0	2	
	Rec., ...	1	0	1	0	0	0	2	
	Deaths,	0	0	0	0	0	0	0	0.
27,000,	Totals,	0	0	0	1	0	0	1	
	Rec., ...	0	0	0	0	0	0	0	
	Deaths,	0	0	0	1	0	0	1	100.
28,000,	Totals,	1	0	0	0	0	0	1	
	Rec., ...	1	0	0	0	0	0	1	
	Deaths.	0	0	0	0	0	0	0	0.
29,000,	Totals,	0	0	0	0	0	1	1	
	Rec., ...	0	0	0	0	0	1	1	
	Deaths,	0	0	0	0	0	0	0	0.
30,000,	Totals,	18	5	2	2	1	0	28	
	Rec., ...	17	5	1	1	1	0	25	
	Deaths,	1	0	1	1	0	0	3	10.71
33,000,	Totals,	0	1	0	0	0	0	1	
	Rec., ...	0	1	0	0	0	0	1	
	Deaths,	0	0	0	0	0	0	0	0.
34,000,	Totals,	1	0	0	0	0	0	1	
	Rec., ...	1	0	0	0	0	0	1	
	Deaths,	0	0	0	0	0	0	0	0.
35,000,	Totals,	4	1	0	0	0	0	5	
	Rec., ...	3	1	0	0	0	0	4	
	Deaths.	1	0	0	0	0	0	1	20.
38,000,	Totals,	0	1	0	0	0	0	1	
	Rec., ...	0	1	0	0	0	0	1	
	Deaths,	0	0	0	0	0	0	0	0.
39,000,	Totals,	0	0	1	0	0	0	1	
	Rec., ...	0	0	0	0	0	0	1	
	Deaths,	0	0	0	0	0	0	0	0.
40,000,	Totals,	2	1	1	0	0	0	4	
	Rec., ...	2	1	1	0	0	0	4	
	Deaths,	0	0	0	0	0	0	0	0.
42,000,	Totals,	0	0	0	0	1	0	1	
	Rec., ...	0	0	0	0	1	0	1	
	Deaths,	0	0	0	0	0	0	0	0.
45,000,	Totals,	3	1	0	0	0	0	4	
	Rec., ...	3	0	0	0	0	0	3	
	Deaths,	0	1	0	0	0	0	1	25.

TABLE VI—Continued.

Number of Units.	Results.	1st day.	2nd day.	3rd day.	4th day.	5th day.	6th day and over.	Total.	Percentage.
46,000,	Totals,	0	1	0	0	0	0	1	
	Rec., ...	0	0	0	0	0	0	0	
	Deaths,	0	1	0	0	0	0	1	100.
50,000,	Totals,	1	0	0	1	0	0	2	
	Rec., ...	1	0	0	1	0	0	2	
	Deaths,	0	0	0	0	0	0	0	0.
54,000,	Totals,	1	0	0	0	0	0	1	
	Rec., ...	1	0	0	0	0	0	1	
	Deaths,	0	0	0	0	0	0	0	0.
55,000,	Totals,	4	0	0	0	0	1	5	
	Rec., ...	4	0	0	0	0	1	5	
	Deaths,	0	0	0	0	0	0	0	0.
59,000,	Totals,	1	0	0	0	0	0	1	
	Rec., ...	1	0	0	0	0	0	1	
	Deaths,	0	0	0	0	0	0	0	0.
60,000,	Totals,	1	1	0	0	0	0	2	
	Rec., ...	1	1	0	0	0	0	2	
	Deaths,	0	0	0	0	0	0	0	0.
65,000,	Totals,	1	0	0	0	0	0	1	
	Rec., ...	1	0	0	0	0	0	1	
	Deaths,	0	0	0	0	0	0	0	0.
74,000,	Totals,	1	0	0	0	0	0	1	
	Rec., ...	1	0	0	0	0	0	1	
	Deaths,	0	0	0	0	0	0	0	0.
80,000,	Totals.	0	1	0	0	0	0	1	
	Rec., ...	0	1	0	0	0	0	1	
	Deaths,	0	0	0	0	0	0	0	0.
83,500,	Totals,	0	0	1	0	0	0	1	
	Rec., ...	0	0	0	0	0	0	0	
	Deaths,	0	0	1	0	0	0	1	100.
90,000,	Totals,	0	0	0	0	0	1	1	
	Rec., ...	0	0	0	0	0	1	1	
	Deaths,	0	0	0	0	0	0	0	0.
93,000,	Totals,	0	1	0	0	0	0	1	
	Rec., ...	0	1	0	0	0	0	1	
	Deaths,	0	0	0	0	0	0	0	0.
115,000,	Totals,	1	0	0	0	0	0	1	
	Rec., ...	0	0	0	0	0	0	0	
	Deaths,	1	0	0	0	0	0	1	100.

TABLE VII.

Antitoxin Treatment of Diphtheria for 1911.

Initial Dose, 5,000 units.

Statement Showing cases where Subsequent Treatments with Antitoxin were made after first 24 hours.

Results.	Number of Cases.	Units Used.	Results.	Number of Cases.	Units Used.
Totals,	19	1,000	Totals,	6	11,000
Rec.,	19		Rec.,	6	
Deaths,	0		Deaths,	0	
Totals,	7	2,000	Totals,	2	12,000
Rec.,	7		Rec.,	2	
Deaths,	0		Deaths,	0	
Totals,	1	2,500	Totals,	4	13,000
Rec.,	1		Rec.,	3	
Deaths,	0		Deaths.	1	
Totals,	34	3,000	Totals,	5	14,000
Rec.,	32		Rec.,	5	
Deaths,	2		Deaths,	0	
Totals,	4	4,000	Totals,	82	15,000
Rec.,	3		Rec.,	76	
Deaths,	1		Deaths,	6	
Totals,	479	5,000	Totals,	2	16,000
Rec.,	449		Rec.,	2	
Deaths,	30		Deaths,	0	
Totals,	27	6,000	Totals,	1	17,000
Rec.,	26		Rec.,	0	
Deaths,	1		Deaths,	1	
Totals,	4	7,000	Totals,	4	18,000
Rec.,	4		Rec.,	4	
Deaths,	0		Deaths,	0	
Totals,	2	7,500	Totals,	34	20,000
Rec.,	1		Rec.,	29	
Deaths,	1		Deaths,	5	
Totals,	11	8,000	Totals,	1	21,000
Rec.,	10		Rec.,	1	
Deaths,	1		Deaths,	0	
Totals,	9	9,000	Totals,	1	22,000
Rec.,	9		Rec.,	0	
Deaths,	0		Deaths,	1	
Totals,	187	10,000	Totals,	1	23,000
Rec.,	177		Rec.,	1	
Deaths,	10		Deaths,	0	

TABLE VII—Continued.

Results.	Number of Cases.	Units Used.	Results.	Number of Cases.	Units Used.
Totals,	11	25,000	Totals,	1	50,000
Rec.,	9		Rec.,	1	
Deaths,	2		Deaths,	0	
Totals,	2	29,000	Totals,	2	55,000
Rec.,	2		Rec.,	2	
Deaths,	0		Deaths,	0	
Totals,	9	30,000	Totals,	1	60,000
Rec.,	8		Rec.,	1	
Deaths,	1		Deaths,	0	
Totals,	1	33,000	Totals,	1	69,000
Rec.,	1		Rec.,	1	
Deaths,	0		Deaths,	0	
Totals,	4	35,000	Totals,	1	70,000
Rec.,	4		Rec.,	1	
Deaths,	0		Deaths,	0	
Totals,	1	39,000	Totals,	1	78,500
Rec.,	1		Rec.,	0	
Deaths,	0		Deaths,	1	
Totals,	3	40,000	Totals,	1	85,000
Rec.,	2		Rec.,	1	
Deaths,	1		Deaths,	0	
Totals,	1	41,000	Totals,	1	88,000
Rec.,	0		Rec.,	1	
Deaths,	1		Deaths,	0	
Totals,	3	45,000	Totals,	1	105,000
Rec.,	3		Rec.,	0	
Deaths,	0		Deaths,	1	
Totals,	1	49,000			
Rec.,	1				
Deaths,	0				

IMMUNIZING TREATMENT FOR THE YEAR 1911.

In addition to the curative treatment of diphtheria for which antitoxin is furnished free by the State to the indigent, the Department of Health also furnishes free for use in preventing the spread of diphtheria what is known as an immunizing dose of antitoxin, 1,000 units in strength, with which physicians are instructed to immunize all those in the household where a true case of diphtheria is found as well as all those outside of the house who may have come in contact with the patient.

Physicians are also requested and they agree when receipting for the antitoxin from the distributor, to furnish the Department of Health with a clinical report for all persons immunized as well as for all those treated for cure and the clinical reports received in which antitoxin furnished by the State has been used for the purpose of the immunization of persons who had been exposed to diphtheria from January 1st, 1911 to December 31st, 1911, show that six thousand nine hundred six (6,906) persons had been immunized, of which number but 125 were reported as having contracted the disease at some time within twenty-one days after immunization treatment.

The total number immunized in 1911 shows an increase of 1,712 over that of the previous year and is a further indication that physicians all over the State are following more closely the instructions of the Commissioner of Health to immediately immunize all those found in close proximity to the patient having diphtheria and thereby stop the spread of the disease.

The following statement will show the total number immunized, the number not developing diphtheria, the number developing diphtheria, the number of recoveries, the number of deaths, for the years 1905, 1906, 1907, 1908, 1909, 1910 and 1911.

STATEMENT SHOWING RESULTS OF TREATMENT FOR IMMUNIZATION WITH DIPHTHERIA ANTITIOXIN FOR 1905-1911, inclusive.

Year.	Number treated.	Number not developing diphtheria.	Number developing diphtheria.	Recoveries.	Deaths.
1905,	155	150	5	5	0
1906,	2334	2257	77	74	3
1907,	3799	3765	34	32	2
1908,	3965	3920	45	37	8
1909,	4847	4738	109	106	3
1910,	5194	5107	87	81	6
1911,	6906	6781	125	121	4
Totals,	27200	26718	482	456	26

Out of the 125 persons immunized who contracted the disease, 121 recovered and but 4 died.

It will be noted in the following table No. 8, that the number of units used in immunizing the 6,906 persons, ranges from 100 units up to 16,000 units, although nearly the entire number, or 6,078 persons, were immunized by the use of only one package of 1,000 units of diphtheria antitoxin for each person.

For results in detail of the treatment for immunization for the year 1911, the following Table No. 8, is presented.

TABLE VIII.

Showing the Results of Treatment for Immunization for 1911.

Number Treated for Immunization.	Units used.	Number not developing diphtheria.	Number developing diphtheria.	Recoveries.	Deaths.
1,	100	1	0	0	0
1,	150	1	0	0	0
2,	200	2	0	0	0
1,	250	1	0	0	0
8,	300	8	0	0	0
4,	400	4	0	0	0
163,	500	162	1	1	0
5,	600	5	0	0	0
2,	666 2-3	2	0	0	0
2,	700	2	0	0	0
10,	750	10	0	0	0
1,	800	1	0	0	0
6,194,	1,000	6078	116	112	4
2,	1,250	2	0	0	0
81,	1,500	81	0	0	0
6,	1,666 2-3	6	0	0	0
52,	2,000	48	4	4	0
14,	2,500	14	0	0	0
244,	3,000	241	3	3	0
1,	4,000	1	0	0	0
97,	5,000	96	1	1	0
1,	5,500	1	0	0	0
11,	6,000	11	0	0	0
2,	10,000	2	0	0	0
1,	16,000	1	0	0	0
6,906,	....	6781	125	121	4

SUMMARY.

1905.

Number of cases cured during October, November and December, 1905	255
Number of deaths,	38
Total number treated,	293
Percentage of deaths,	12.96
Number immunized,	155
Number immunized and later contracting the disease,	5
Number of syringes, 1,000 units, dispensed by distributors,	327
Number of syringes, 3,000 units, dispensed by distributors,	619
Total cost (including "Initial Supply") which cost $6,199.73,	$7,251.80

1906.

Number of cases cured from January 1st to December 31st, 1906,	3,136
Number of deaths,	393
Total number treated,	3,529
Percentage of deaths,	11.13
Number immunized,	2,334
Number immunized and later contracting the disease, ...(Total),	77
Number immunized and later contracting the disease, ...(Recovered),	74
Number immunized and later contracting the disease, ...(Deaths),	3
Number of syringes, 1,000 units, dispensed by distributors,	3,725
Number of syringes, 3,000 units, dispensed by distributors,	6,564
Total cost,	$16,192.32

1907.

Number of cases cured from January 1st to December 31st, 1907,	4,895
Number of deaths,	376
Total number treated,	5,271
Percentage of deaths,	7.13
Number immunized,	3,799
Number immunized and later contracting the disease, ...(Total),	34
Number immunized and later contracting the disease, ...(Recovered),	32
Number immunized and later contracting the disease, ...(Deaths),	2
Number of syringes, 1,000 units, dispensed by distributors,	3,431
Number of syringes, 3,000 units, dispensed by distributors,	6,931
Total cost,	$17,387.13

1908.

Number of cases cured from January 1st to December 31st, 1908,	5,794
Number of deaths,	542
Total number treated,	6,336
Percentage of deaths,	8.55
Number immunized,	3,965
Number immunized and later contracting the disease, ...(Total),	45
Number immunized and later contracting the disease, ...(Recovered),	37
Number immunized and later contracting the disease, ...(Deaths),	8
Number of syringes, 1,000 units, dispensed by distributors,	4,326
Number of syringes, 3,000 units, dispensed by distributors,	8,840
Number of syringes, 5,000 units, dispensed by distributors,	61
Total cost,	$14,056.40

1909.

Number of cases cured from January 1st to December 31st, 1909,	4,949
Number of deaths,	416
Total number treated,	5,365
Percentage of deaths,	7.75
Number immunized,	4,847
Number immunized and later contracting the disease, ...(Total),	109
Number immunized and later contracting the disease, ...(Recovered,	106
Number immunized and later contracting the disease, ...(Deaths),	3
Number of syringes, 1,000 units, dispensed by distributors,	5,958
Number of syringes, 3,000 units, dispensed by distributors,	11,086
Number of syringes, 5,000 units, dispensed by distributors,	284
Total cost,	$16,565.52

1910.

Number of cases cured from January 1st to December 31st, 1910, ...	5,965
Number of deaths, ...	559
Total number treated, ...	6,524
Percentage of deaths, ...	8.56
Number immunized, ...	5,194
Number immunized and later contracting the disease, ...(Total), ...	87
Number immunized and later contracting the disease, ...(Recovered), ..	81
Number immunized and later contracting the disease, ...(Deaths), ...	6
Number of syringes, 1,000 units, dispensed by distributors, ...	6,237
Number of syringes, 3,000 units, dispended by distrbiutors, ...	10,501
Number of syringes, 5,000 units, dispensed by distributors, ...	2,800
Total cost, ...	$22,232.18

1911.

Number of cases cured from January 1st to December 31st, 1911, ...	7,283
Number of deaths, ...	510
Total number treated, ...	7,793
Percentage of deaths, ...	6.54
Number immunized, ...	6,906
Number immunized and later contracting the disease, ...(Total), ...	125
Number immunized and later contracting the disease, ...(Recovered), ..	121
Number immunized and later contracting the disease, ...(Deaths), ...	4
Number of syringes, 1,000 units, dispensed by distributors, ...	8,180
Number of syringes, 3,000 units, dispensed by distributors, ...	10,000
Number of syringes, 5,000 units, dispensed by distributors, ...	6,076
Total cost, ...	$27,983.01

GENERAL SUMMARY.

1905-1911.

Number of cases cured from October, 1905, to December 31st. 1911, ...	32,277
Number of deaths, ...	2,834
Total number treated, ...	35,111
Percentage of deaths, ...	8.07
Number immunized, ...	27,200
Number immunized and later contracting the disease, ...(Total), ...	482
Number immunized and later contracting the disease, ...(Recovered), ..	456
Number immunized and later contracting the disease, ...(Deaths), ...	26
Number of syringes, 1,000 units, dispensed by distributors, ...	32,184
Number of syringes, 3,000 units, dispensed by distributors, ...	54,541
Number of syringes, 5,000 units, dispensed by distributors, ...	9,221
Total cost, ...	$121,668.36

VACCINE AND VACCINE SUPPLIES.

The free distribution of Vaccine and Vaccine Supplies is made by the Department of Health through the Division of Distribution of Biological Products when requisition is made, upon the recommendation of County Medical Inspectors—for the poor in townships not first-class and to poor charitable institutions when asked for during a local or general epidemic of smallpox—unless otherwise ordered by the Commissioner of Health in extreme cases.

Under the urgency of a serious epidemic, however, the stringency of this rule may be relaxed, the safety of the people being of vastly more importance than economy of administration.

During the year 1911, 158 cases of smallpox were found in 19 different counties throughout the entire State, as shown by the following table:—

Counties.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Totals.
Adams,	....	....	....	....	3	1	....	....	....	....	....	....	4
Allegheny,	1	3	....	....	1	....	....	....	....	....	....	3	8
Columbia,	4	....	....	....	....	....	....	....	....	....	....	....	4
Chester,	1	....	....	....	....	....	....	....	....	....	....	....	1
Dauphin,	....	2	10	....	....	....	....	....	....	....	....	11	23
Delaware,	....	....	....	1	2	....	....	....	....	....	....	6	9
Erie,	....	....	....	....	....	....	....	1	....	....	....	....	1
Fayette,	....	....	....	....	....	....	....	....	....	....	....	1	1
Franklin,	....	....	3	4	47	13	5	....	....	....	....	....	72
Jefferson,	....	....	....	....	....	....	....	....	....	....	3	....	3
Juniata,	....	1	5	3	2	....	....	....	....	....		....	11
Lancaster,	....	....	....	1	....	....	....	....	....	....	....	....	1
Lehigh,	....	....	....	1	....	....	....	....	....	....	....	....	1
Montour,	5	....	....	....	....	....	....	....	....	....	....	....	5
Northumberland,	....	....	....	1	1	....	....	....	....	....	....	....	2
Perry,	....	....	....	1	....	....	....	....	....	....	....	....	1
Philadelphia,	3	....	....	....	....	....	....	....	....	....	....	4	7
Somerset,	1	....	....	....	....	....	....	....	....	....	....	....	1
York,	....	....	....	....	....	....	....	....	....	....	3	....	3
Total,	15	6	18	12	56	14	5	1	0	0	6	25	158

The following statement shows the number of cases of smallpox ocurring throughout the State of Pennsylvania during the years 1906, 1907, 1908, 1909, 1910 and 1911, by months:—

	1906	1907	1908	1909	1910	1911
January,	10	7	2	4	14	15
February,	9	4	2	9	41	6
March,	4	9	9	2	40	18
April,	12	7	9	0	8	12
May,	19	3	1	13	22	56
June,	7	6	2	3	7	14
July,	7	14	1	6	23	5
August,	3	4	3	2	4	1
September,	0	1	11	0	6	0
October,	0	2	13	0	0	0
November,	9	1	13	4	1	6
December,	0	4	11	2	2	25
	80	62	77	45	168	158

The following table shows the total number of cases of smallpox; the number of glycernized vaccine points supplied; the number of tubes vacine lymph supplied; and the cost of furnishing vaccine supplies for the years 1906 to 1911, inclusive.

Year.	Number of cases, Smallpox.	Number of Vaccine Points.	Number of Tubes of Lymph.	Cost.
1906,	80	1,610	110	$68 47
1907,	62	1,070	390	42 83
1908,	77	770	390	45 23
1909,	45	990	100	45 56
1910,	168	446	1,820	148 59
1911,	158	2,843	100	191 295
Total,	584	7,729	2,910	$542 975

TUBERCLE BACILLI PRODUCTS.

The Department of Health, through the Division of Distribution of Biological Products, began the distribution of tubercle bacilli extract and suspension of dead tubercle bacilli for the treatment of tuberculosis among the indigent throughout the State of Pennsylvania, to the physicians in charge of dispensaries, June 29, 1909. There are at present 116 dispensaries including the Pennsylvania State South Mountain Sanatorium at Mont Alto, Franklin county, Pennsylvania. At the time the distribution of tubercle bacilli products was begun, both the tubercle bacilli extract and the suspension of dead tubercle bacilli were manufactured and put up in syringes containing dilutions of from No. 1 to No. 10, inclusive, only, but on August 4, 1910. the number of dilutions used in the treatment of tuberculosis was increased by the addition of dilutions No. 11 to No. 16, in both the extract and suspension, and since that time the number of dilutions in the extract has been increased to No. 20, and have been quite extensively used during the year 1911 at the Pennsylvania State South Mountain Sanatorium, at Mont Alto, Franklin county, Pennsylvania, as well as by the physicians in charge of 33 out of the total number of 115 dispensaries located throughout the State for the treatment of tuberculous patients.

At 33 of the 115 dispensaries during the year 1911, the tubercle bacilli products were used for 238 patients as compared with 281, during the year 1910, while at the Pennsylvania State South Mountain Sanatorium, at Mont Alto, Franklin county, Pennsylvania, the products were used for 425 patients during 1911, as compared with 324 patients during the year 1910; the total number of patients, however, treated during the year 1911 at the 33 out of 116 dispensaries, including Mont Alto Sanatorium, being 663, as compared with 605, during the year 1910.

The following statement shows the number of patients treated at the dispensaries named from the beginning of the distribution and use of the tubercle bacilli products from June 29th, 1909 to December 31st, 1909; from January 1st to December 31st, 1910, and also from January 1st to December 31st, 1911, by years, giving the number treated during that period and the locations of dispensaries.

Physicians in Charge.	Place.	Dispensary No.	No. of Patients, 1909.	No. of Patients, 1910.	No. of Patients, 1911.
Dr. Fred C. Johnson,	Mont Alto,	Special	91	324	425
Dr. Chas. H. Miner,	Wilkes-Barre,	1	5	19	37
Dr. J. S. Miller,	York,	2	0	1	0
Dr. A. J. Riegel,	Lebanon,	5	7	12	2
Dr. H. S. Falk.	Emporium,	8	1	4	1
Dr. W. E. Matthews.	Johnstown,	9	6	5	1
Dr. C. H. Brisbin,	Lewistown,	10	1	1	0
Dr. H. X. Bonbrake,	Chambersburg,	11	0	2	0
Dr. H. M. Hiller,	Chester,	12	6	2	0
Dr. Paul Hartman,	Harrisburg,	13	7	11	10
Dr. Jos. D. Findley,	Altoona,	14	0	1	1
Dr. H. D. Hockenberry,	Butler,	15	0	17	41
Dr. S. B. Arment,	Berwick.	16	0	0	2
Dr. S. M. Rinehart,	Pittsburgh,	20	10	21	4
Dr. A. P. Francine,	Philadelphia,	21	4	11	8
Dr. Bruce Snodgrass,	Rochester,	22	0	1	3
Dr. C. W. Youngman,	Williamsport,	33	4	45	17
Dr. J. D. Moore,	New Castle,	35	5	17	17
Dr. J. L. Mowery,	Lancaster,	39	10	36	26
Dr. J. K. Roberts,	Meadville,	41	2	3	1
Dr. J. T. Rimer,	Clarion,	43	0	0	1
Dr. R. B. Watson,	Lock Haven,	46	2	0	0
Dr. H. C. Frontz,	Huntingdon,	47	2	9	5
Dr. M. F. Cawley,	Allentown,	51	0	1	3
Dr. J. R. Dickson.	Gettysburg,	60	0	0	2
Dr. W. de la M. Hill,	Everett,	61	2	1	0
Dr. W. C. Gayley,	Hazleton,	68	0	2	8
Dr. Daniel S. Rice,	Hastings,	69	0	1	1
Dr. W. T. Williams,	Mt. Carmel,	71	0	4	5
Dr. W. S. Musser,	Tyrone,	79	0	0	5
Dr. C. E. McGirk,	Philipsburg,	80	5	9	6
Dr. D. P. Blose,	McKeesport,	81	5	1	4
Dr. H. M. Wasley,	Shenandoah,	85	5	6	2
Dr. J. H. Bittinger,	Hanover,	86	2	2	0
Dr. A. A. Seem.	Bangor,	87	0	0	1
Dr. W. D. Chase,	Bethlehem,	98	0	2	1
Dr. A. P. Fogelman,	Homestead,	100	0	0	1
Dr. Bruce Snodgrass,	Beaver Falls,	103	6	16	11
Dr. W. G. Turnbull,	Frankford, Phila.,	107	5	2	0
Dr. W. C. Schultz.	Waynesboro,	108	5	5	6
Dr. J. M. McNall,	Wilkinsburg,	109	0	1	2
Dr. J. B. Cressinger,	Sunbury,	110	4	4	0
Dr. W. A. Arnold,	Tarenium,	111	8	6	3
			210	605	663

INSTRUCTIONS REGARDING THE USE OF TUBERCLE BACILLI PRODUCTS.

TO THE MEDICAL STAFF OF THE DEPARTMENT.

Gentlemen:—In the use of the Suspension of Dead Tubercle Bacilli and Tubercle Bacilli Extract for the treatment of tuberculosis by cell immunization, the patients should be carefully selected, as my preparations are not supposed to be of value in all cases. The best results are to be expected in patients who have a small amount of tissue involvement and in which the body cells have not become saturated with the toxin. Today I am pursuing exactly the same principle of treatment with the dead bacilli in place of the involution forms as I did in 1889, i. e., with small graduated doses with a progressive increase of strength to produce, by degrees, an increased power of the tissues to resist the action of the tubercle bacilli. During the early use of all preparations made directly from tubercle bacilli some of the medical profession made grave mistakes, and by administering large and too frequent doses they killed the tissues, and often caused general tuberculosis. In this way a hypersusceptibility was maintained at all times.

THESE PRODUCTS ARE PREPARED IN THE FOLLOWING STRENGTHS.

SUSPENSION OF DEAD TUBERCLE BACILLI.

This Suspension of Dead Tubercle Bacilli is prepared after the method of Dr. Samuel G. Dixon. (See original article. "Possibility of Establishing Tolerance for the Tubercle Bacillus," Medical News, October 19, 1889, p. 435). The preparation is a suspension, in physiologic salt solution, of tubercle bacilli which have been degreased by prolonged treatment with alcohol and ether. Equal quantities of human and bovine tubercle bacilli are killed with heat and freed from the products of the tubercle bacillus liberated during its growth on glycerin veal broth. The bacilli are thoroughly dried in a vacuum dessicator. The fatty products are removed by prolonged extraction with alcohol and ether, in a Soxhlet apparatus. A homogeneous suspension of the degreased ground bacilli is made in physiologic salt solution.

The suspension is proved to be sterile by animal tests and cultural inoculations.

DOSAGE.

This suspension is supplied in the following series of dilutions, so that the doses may be increased as deemed advisable:

Dilution No. 1, containing one one thousandth of a milligram (0.000,001 gram) of dead tubercle bacilli.

Dilution No. 2, containing one one-hundredth of a milligram (0.000,01 gram) of dead tubercle bacilli.

Dilution No. 3, containing two one-hundredths of a milligram (0.000,02 gram) of dead tubercle bacilli.

Dilution No. 4, containing three one-hundredths of a milligram (0.000,03 gram) of dead tubercle bacilli.

Dilution No. 5, containing four one-hundredths of a milligram (0.000,04 gram) of dead tubercle bacilli.

Dilution No. 6, containing five one-hundredths of a milligram (0.000,05 gram) of dead tubercle bacilli.

Dilution No. 7, containing six one-hundredths of a milligram (0.000,06 gram) of dead tubercle bacilli.

Dilution No. 8, containing seven one-hundredths of a milligram (0.000,07 gram) of dead tubercle bacilli.

Dilution No. 9, containing eight one-hundredths of a milligram (0.000,08 gram) of dead tubercle bacilli.

Dilution No. 10, containing nine one-hundredths of a milligram (0.000,09 gram) of dead tubercle bacilli.

Dilution No. 11, containing ten one-hundredths of a milligram (0.000,10 gram) of dead tubercle bacilli.

Dilution No. 12, containing eleven one-hundredths of a milligram (0.000,11 gram) of dead tubercle bacilli.

Dilution No. 13, containing twelve one-hundreths of a milligram (0.000,12 gram) of dead tubercle bacilli.

Dilution No. 14, containing thirteen one-hundredths of a milligram (0.000,13 gram) of dead tubercle bacilli.

Dilution No. 15, containing fourteen one-hundredths of a milligram (0.000,14 gram) of dead tubercle bacilli.

Dilution No. 16, containing fifteen one-hundredths of a milligram (0.000,15 gram) of dead tubercle bacilli.

TUBERCLE BACILLI EXTRACT.

PREPARATION.

This Tubercle Bacilli Extract is prepared after the method of Dr. Samuel G. Dixon. (See original article "Fluid of Dixon" and the "Possibility of Checking the Tuberculous Process in Man by the Agency of a Metabolic Product of the Tubercle Bacillus." Medical News, January 17, 1891, p. 87). The solution consists of an extract of living tubercle bacilli which have been washed with ether and extracted with sterile physiologic salt solution. Equal quantities of human and bovine tubercle bacilli are freed from bouillon and glycerin and washed with ether to remove fatty products. These bacilli are then ground and extracted with sterile physiologic salt solution. All tubercle bacilli are removed from the fluid by triple filtration through porcelain, as determined by animal tests and microscopic examination. The fluid is proved to be free from all bacteria by cultural inoculations.

DOSAGE.

This Extract is supplied in the following series of dilutions, so that the doses may be increased as deemed advisable:

Dilution No. 1, containing the extract from one milligram (0.001 gram) of tubercle bacilli.

Dilution No. 2, containing the extract from ten milligrams (0.01 gram) of tubercle bacilli.

Dilution No. 3, containing the extract from twenty milligrams (0.02 gram) of tubercle bacilli.

Dilution No. 4, containing the extract from thirty milligrams (0.03 gram) of tubercle bacilli.

Dilution No. 5, containing the extract from forty milligrams (0.04 gram) of tubercle bacilli.

Dilution No. 6, containing the extract from fifty milligrams (0.05 gram) of tubercle bacilli.

Dilution No. 7, containing the extract from sixty milligrams (0.06 gram) of tubercle bacilli.

Dilution No. 8, containing the extract from seventy milligrams (0.07 gram) of tubercle bacilli.

Dilution No. 9, containing the extract from eighty milligrams (0.08 gram) of tubercle bacilli.

Dilution No. 10, containing the extract from ninety milligrams (0.09 gram) of tubercle bacilli.

Dilution No. 11, containing the extract from 100 milligrams (0.10 gram) of tubercle bacilli.

Dilution No. 12, containing the extract from 110 milligrams (0.11 gram) of tubercle

Dilution No. 13, containing the extract from 120 milligrams (0.12 gram) of tubercle bacilli.

Dilution No. 14, containing the extract from 130 milligrams (0.13 gram) of tubercle bacilli.

Dilution No. 15, containing the extract from 140 milligrams, (0.14 gram) of tubercle bacilli.

Dilution No. 16, containing the extract from 150 milligrams (0.15 gram) of tubercle bacilli.

Dilution No. 17, containing the extract from 160 milligrams (0.16 gram) of tubercle bacilli.

Dilution No. 18, containing the extract from 170 milligrams (0.17 gram) of tubercle bacilli.

Dilution No. 19, containing the extract from 180 milligrams (0.18 gram) of tubercle bacilli.

Dilution No. 20, containing the extract from 190 milligrams (0.19 gram) of tubercle bacilli.

Each dose of the various dilutions is supplied in a syringe ready for direct injection, and contains the strengths as above indicated. You should begin with dilution No. 1 of the suspension of dead tubercle bacilli (0.000,001 gram) or the tubercle bacilli extract (0.001 gram). This injection may be repeated at five-day intervals and if after five injections there is very little or no reaction, the treatment with No. 2, suspension of dead tubercle bacilli (0.000,01 gram) or tubercle bacilli extract (0.01 gram) should be undertaken. If after five injections at five-day intervals this should not produce any material reaction, a series of five injections of No. 3, suspension of dead tubercle bacilli (0.000,02 gram), or tubercle bacilli extract (0.02 gram) can be given; then No. 4, suspension of dead tubercle bacilli (0.000,03 gram) or tubercle bacilli extract (0.03 gram); following then with No. 5, suspension of dead tubercle bacilli (0.000,04 gram) —and so on up to strength No. 16, watching, of course, for a reaction which should govern the treatments subsequent to No. 5.

The physician-in-charge should use his judgment as to how the patient feels in general, depending, of course, upon the manifestations of each one's condition as to the strength, the weight, the sleep, the circulation, the appetite, the cough and the temperature. When these are good, the patient presents a good picture along the line of recovery, and moderate reaction may be tolerated. It should be the aim of the physician administering the treatment to increase the dosage with such care as not to produce a severe reaction during the entire time of treatment. However, if a severe reaction should occur, it is advisable to return to the next, or possibly even the second weaker dilution.

SAMUEL G. DIXON,
Commissioner.

Form B. P. 501.

Tubercle Bacilli Extract.
Gram. ....
Dil. No. ....
Lab. No. ......Exp. ....
Manufacturer.
....
Dispensary No. ....
....

Form B. P. 501.
COMMONWEALTH OF PENNSYLVANIA.
DEPARTMENT OF HEALTH.
Tubercle Bacilli Extract, Dil. No. .....(......Gram.)
Manufacturer .....Laboratory No. .....Expires .....
Patient .... Address ....
Date of Use ....
Physician's Signature ....
Address ....
Dispensary No., ...
(Place.) (County.)

This slip must be forwarded by Physician in charge of Dispensary to the Department of Health immediately after Product has been used.

SAMUEL G. DIXON, Commissioner.

Form B. P. 502.
Suspension Dead Tubercle Bacilli.
Gram. ....
Dil. No. ....
Lab. No. ......Exp. ....
Manufacturer.
....
Dispensary No. ....
....

Form B. P. 502.
COMMONWEALTH OF PENNSYLVANIA.
DEPARTMENT OF HEALTH.
Suspension Dead Tubercle Bacilli, Dil. No. (..Gram.)
Manufacturer .....Laboratory No. .....Expires .....
Patient ....Address ....
Date of Use ....
Physician's Signature ....
Address ....
Dispensary No., ...
(Place.) (County.)

This slip must be forwarded by Physician in charge of Dispensary to the Department of Health immediately after Product has been used.

SAMUEL G. DIXON, Commissioner.

Form B. P. 507.

COMMONWEALTH OF PENNSYLVANIA.

DEPARTMENT OF HEALTH.

REPORT OF USE OF TUBERCLE BACILLI PRODUCTS.

Fill out this blank immediately after each treatment and forward weekly to the Department of Health, Harrisburg, Pa.

Patient's name, ...Address, ...County, ...
Age, ...years. Sex, ... Color, ...Report No., ...
Type of disease: Incipient, Moderately advanced, Advanced.

(Specify by crossing out type not applicable.)

TUBERCLE BACILLI PRODUCTS USED.

Dilution No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Date of Treatment
Extract, (No. of Pkgs.), ...	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	
Laboratory No., ...	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	
Suspension (No. of Pkgs.),..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	
Laboratory No., ...	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	

State complications, if any ....
State termination, with date, ...Disease Arrested, Treatment Discontinued, Patient Transferred, Death.

(Specify by crossing out term not applicable.)

Dispensary No., ...M. D.
Address, ... Physician in charge.)

(Place.) (County.) Date, ...
(Month) (Day) (Year)

The following statements give a summary of the number of packages of each dilution of Tubercle Bacilli Extract from No. 1 to No. 7, inclusive, the number of packages of each dilution of Suspension of Dead Tubercle Bacilli from No. 1 to No. 5, inclusive, used by months, with cost of same, from June 29, 1909, up to and including December 31st, 1909; also, the number of packages tubercle bacilli extract and suspension of dead tubercle bacilli supplied and used by the months with cost of same from January 1st, 1910, to December 31st, 1911, inclusive.

TUBERCLE BACILLI PRODUCTS USED DURING 1909.

Months.	No. of pkgs., extract Dil. No. 1 to No. 7.	No. of pkgs. suspension Dil. No. 1 to No. 5.	Cost.
July,	260	0	$130 00
August,	660	25	322 50
September,	831	100	465 50
October,	820	100	459 32
November,	1,866	120	993 00
December,	926	235	630 50
Total,	5,363	580	$3,000 82
			68 Cr.
			$3,000 14

TUBERCLE BACILLI PRODUCTS SUPPLIED IN 1910.

Months.	No. of pkgs., extract Dil. No. 1 to No. 16.	No. of pkgs. suspension Dil. No. 1 to No. 16.	Total No. of packages.	Total cost per month.	Credit per month.	Net cost per month.
January,	674	75	749	$374 50	$13 58	$360 92
February,	799	475	1,274	637 00	0 00	637 00
March,	340	120	460	230 00	0 00	230 00
April,	1,011	135	1,146	573 00	1 08	571 92
May,	686	267	953	476 50	0 00	476 50
June,	1,164	200	1,364	682 00	107 33	574 67
July,	491	135	626	313 00	60	312 40
August,	1,015	285	1,300	650 00	0 00	650 00
September,	199	15	214	107 00	88	106 12
October,	419	145	564	282 00	2 18	279 82
November,	580	15	595	297 50	0 00	297 50
December,	310	175	485	242 50	39 36	203 14
Total,	7,688	2,042	9,730	$4,865 00	$165 01	$4,699 99

TUBERCLE BACILLI PRODUCTS USED DURING 1910.

Months.	No. of pkgs., extract Dil No. 1 to No. 14.	No. of pkgs. suspension Dil. No. 1 to No. 13.	Total No. of packages.
January,	722	68	790
February,	651 2-3	78	729 2-3
March,	648	122	770
April,	907	97	1,004
May,	665	161	826
June,	631	143	774
July,	476	106	582
August,	524	118	642
September,	450	95	545
October,	493	89	582
November,	562	104	666
December,	467 3-4	95	562 3-4
Total,	7,197 5-12	1,276	8,473 5-12

TUBERCLE BACILLI PRODUCTS SUPPLIED IN 1911.

Months.	No. of pkgs., extract Dil. No. 1 to No. 17.	No. of pkgs. suspension Dil. No. 1 to No. 14.	Total No. of packages.	Total cost per month.	Credit per month.	Net cost per month.
January,	255	165	420	$210 00	$7 18	$202 82
February,	573	30	603	301 50	2 45	299 05
March,	1,034	465	1,499	749 50	1 26	748 24
April,	215	70	285	142 50	35 70	106 80
May,	203	25	228	114 00	23	113 77
June,	190	50	240	120 00	1 23	118 77
July,	139	50	189	94 50	1 85	92 65
August,	923	80	1,003	501 50	101 48	400 02
September,	197	117	314	157 00	94 51	62 49
October,	487	126	613	306 50	43	306 07
November,	1,116	340	1,456	728 00	1 93	726 07
December,	401	110	514	257 00	0 00	257 00
Total,	5,736	1,628	7,364	$3,682 00	$248 25	$3,433 75

TUBERCLE BACILLI PRODUCTS USED DURING 1911.

Months.	No. of pkgs., extract Dil. No. 1 to No. 17.	No. of pkgs. suspension Dil. No. 1 to No. 13.	Total No. of packages.
January,	399 ½	89	488 ½
February,	387	80	467
March,	450 9-20	96	546 9-20
April,	398	106	504
May,	323	61	384
June,	334	89	423
July,	277	54	331
August,	387	76	463
September,	340	59	399
October,	487	86	573
November,	530	109	639
December,	451	89	540
Total,	4,763 19-20	994	5,757 19-20

STATEMENT SHOWING NUMBER OF PACKAGES OF TUBERCLE BACILLI PRODUCTS

SUPPLIED BY THE MONTHS FOR THE YEAR 1911.

Tubercle Bacilli Extract.

Dil. No.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Totals.
1,	45	135	471	55	30	41	21	425	5	42	315	65	1,650
2,	20	100	354	25	25	30	20	185	25	192	248	65	1,289
3,	55	103	10	25	24	30	5	161	10	168	133	45	769
4,	25	115	14	15	15	10	15	51	23	55	184	64	586
5,	10	30	16	35	15	5	5	41	34	5	73	14	283
6,	10	20	40	30	10	0	11	6	20	0	37	40	224
7,	10	20	41	0	20	6	0	5	45	0	18	10	175
8,	20	15	31	5	20	16	0	10	15	0	33	15	180
9,	10	5	26	0	19	12	31	10	0	0	25	44	182
10,	5	15	11	0	20	17	9	9	5	4	10	9	114
11,	5	10	0	10	0	11	11	5	5	11	10	4	82
12,	10	0	0	10	0	7	6	5	5	0	15	9	67
13,	10	0	0	5	0	5	0	0	5	5	0	10	40
14,	0	0	10	0	0	0	5	0	0	0	10	0	25
15,	10	5	10	0	0	0	0	5	0	0	0	10	40
16,	10	0	0	0	5	0	0	5	0	5	0	0	25
17,	0	0	0	0	0	0	0	0	0	0	5	0	5
	255	573	1,034	215	203	190	139	923	197	487	1,116	404	5,736

Suspension of Dead Tubercle Bacilli.

Dil. No.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Totals.
1, ...	10	0	205	30	10	0	15	0	50	81	80	20	501
2, ...	10	0	200	25	10	0	10	0	0	10	120	10	395
3, ...	20	0	10	10	0	10	5	55	10	10	80	15	225
4, ...	20	0	10	5	0	20	5	5	22	10	30	20	147
5, ...	10	10	0	0	0	10	5	10	15	5	30	10	105
6, ...	60	10	0	0	0	10	5	10	12	0	0	10	117
7, ...	10	10	10	0	0	0	0	0	3	5	0	10	48
8, ...	10	0	10	0	5	0	0	0	0	5	0	10	40
9, ...	10	0	10	0	0	0	0	0	5	0	0	5	30
10, ...	0	0	10	0	0	0	5	0	0	0	0	0	15
11, ...	0	0	0	0	0	0	0	0	0	0	0	0	0
12, ...	0	0	0	0	0	0	0	0	0	0	0	0	0
13, ...	0	0	0	0	0	0	0	0	0	0	0	0	0
14, ...	5	0	0	0	0	0	0	0	0	0	0	0	5
	165	30	465	70	25	50	50	80	117	126	340	110	1,628

STATEMENT SHOWING NUMBER OF PACKAGES OF TUBERCLE BACILLI PRODUCTS

USED BY THE MONTHS FOR THE YEAR 1911.

Tubercle Bacilli Extract.

Dil. No.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Totals.
1, ...	53	75	146	129	87	128	113	146	101	178	153	120	1,429
2, ...	47½	46	64 9-20	88	85	80	63	93	82	76	119	99	942 19-20
3, ...	53	49	36	28	36	46	27	44	61	80	62	51	573
4, ...	48	45	47	20	23	18	15	28	26	63	71	28	432
5, ...	45	30	24	22	10	12	14	13	13	20	46	56	305
6, ...	18	31	24	17	14	6	9	8	7	16	8	22	180
7, ...	40	26	24	15	8	5	1	1	10	22	16	8	176
8, ...	26	26	23	16	14	8	5	5	2	3	22	18	168
9, ...	24	13	18	22	17	9	13	22	7	3	6	16	170
10, ...	11	21	11	13	15	9	7	12	13	6	5	5	128
11, ...	3	1	7	15	6	7	10	1	5	5	6	11	77
12, ...	6	4	1	4	3	3	0	10	4	5	5	7	52
13, ...	9	8	11	4	0	0	0	1	2	3	4	2	44
14, ...	12	3	3	2	0	0	0	3	2	0	3	4	32
15, ...	4	7	3	3	3	0	0	0	3	2	0	0	25
16, ...	0	2	8	0	2	3	0	0	2	5	3	0	25
17, ...	0	0	0	0	0	0	0	0	0	0	1	4	5
	399½	387	450 9-20	398	323	331	277	387	340	48[illegible]	530	451	4,763 19-20

Suspension of Dead Tubercle Bacilli.

Dil. No.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Totals.
1, ...	19	26	41	60	26	43	22	18	21	38	58	29	401
2, ...	22	15	13	23	18	33	16	27	7	15	17	34	240
3, ...	12	7	11	3	11	8	14	16	15	17	10	14	138
4, ...	8	7	4	4	2	3	1	12	5	5	8	8	67
5, ...	16	4	6	3	0	0	0	3	8	3	9	1	53
6, ...	9	12	3	5	2	0	0	0	2	3	2	2	40
7, ...	2	5	10	4	0	0	0	0	1	3	4	1	30
8, ...	0	4	8	4	2	2	1	0	0	0	0	0	21
9, ...	0	0	0	0	0	0	0	0	0	2	1	0	3
10, ...	0	0	0	0	0	0	0	0	0	0	0	0	0
11, ...	0	0	0	0	0	0	0	0	0	0	0	0	0
12, ...	0	0	0	0	0	0	0	0	0	0	0	0	0
13, ...	1	0	0	0	0	0	0	0	0	0	0	0	1
	89	80	96	106	61	89	54	76	59	86	109	89	994

TETANUS ANTITOXIN.

The distribution of Tetanus Antitoxin in syringes carrying in immunizing dose of 1,500 units, free to the indigent, was begun July 4, 1910. It was carried on by 67 distributors, appointed June 24, 1910, and so scattered over the State that nearly every county has at least one. There are none in Philadelphia and Pittsburgh. The antitoxin was again supplied in ample time for use in July 4, 1911. The distributors were chosen by the Commissioner of Health among those already appointed to distribute diphtheria antitoxin. Tetanus antitoxin being effective when used within 48 hours after injury is received, the object was therefore to so locate these distributing stations that the antitoxin would be accessible to those persons meeting with accidents in any part of Pennsylvania within the prescribed time and the entire State, in the judgment of the Commissioner of Health could be properly cared for by 67 stations located as stated below.

The total number of cases treated during the year was 110 (as against 92 in the previous year) 83 of which were immunized and 27 treated for cure. Out of the total number of cases immunized, being 83, not one single case developed tetanus. Of the 27 cases treated for cure with immunizing doses of tetanus antitoxin where tetanus existed, six recovered and twenty-one died. In one case treatment was begun 360 hours after accident; two cases, 336 hours; two cases, 96 hours and one case, 192 hours. These six recoveries alone amply repaid the State for the effort. Ten of these cases developed the disease from wounds classed as punctures and the remaining seventeen cases from various other injuries. Out of the total number of cases so treated for cure twenty-one were males and six females, with ages ranging from three to fifty-three years.

The total number of packages of 1,500 units, or immunizing doses. of tetanus antitoxin used during the year was two hundred and two (202) or three hundred and three thousand (303,000) units. The largest amount of tetanus antitoxin used for the treatment of a single case was seventy thousand (70,000) units, which treatment resulted in recovery of the patient.

In all of the twenty-one cases treated for cure where death ensued, the clinical reports signed by the physicians treating the cases, show that tetanus had existed for many hours before treatment was begun, ranging from twelve (12) up to five hundred sixteen (516).

A glance at the map to the left will reveal to the reader the exact location of the distributing stations for tetanus antitoxin, which will be found in the centre of the black circle on said map, and the list given below will show the names of the distributors appointed up to and including December 31, 1911.

DISTRIBUTORS OF TETANUS ANTITOXIN.

Appointed by Commissioner of Health,

SAMUEL G. DIXON, M. D.

Tetanus antitoxin for immunizing purposes in 1,500 units syringes may be secured by physicians practicing in this Commonwealth upon their agreeing in writing that no charge of any kind is to be made for the antitoxin and that the person or persons for whom it is obtained are indigent in the sense that they cannot procure the necessities of life and at the same time purchase antitoxin, and also that the physicians will send to the Department of Health a full clinical report as specified by the Commissioner of Health.

Name	Place.	County.
Buehler, L. M.,	Gettysburg,	Adams.
Walker's Pres. Phar,	McKeesport,	Allegheny.
Mayo, Fred H.,	Beaver,	Beaver.
Jordan, F. W.,	Bedford,	Bedford.
Raser, Wm. H.,	Reading,	Berks.
Taylor, C. S.,	Altoona,	Blair.
McLanahan. W. H.,	Tyrone,	Blair.
Kester, E. P.,	Towanda,	Bradford.
Hulshizer, Est. of M.,	Doylestown,	Bucks.
Pursell, Howard,	Bristol,	Bucks.
Redick & Grohman,	Butler,	Butler.
Berry Drug Co.,	Johnstown,	Cambria.
James, E. & Son,	Ebensburg,	Cambria.

Name.	Place.	County.
Emporium Drug Co.,	Emporium,	Cameron.
Mauch Chunk Phar.,	Mauch Chunk,	Carbon.
Green's Phar. Co.,	Bellefonte,	Centre.
Thatcher, Jesse,	West Chester,	Chester.
Reid's Drug Store,	Clarion,	Clarion.
Brenner, F. A.,	Clearfield,	Clearfield.
Read, F. B. & Co.,	Osceola Mills,	Clearfield.
Hilton & Heffner,	Lock Haven,	Clinton.
Easterwood, F. K.,	Meadville,	Crawford.
Lydell, James,	Cambridge Springs,	Crawford.
Gross, E. Z.,	Harrisburg,	Dauphin.
Ross Drug Co.,	Ridgway,	Elk.
Ames, N. F. & Co.,	Corry,	Erie.
Andrews, W. C.,	Erie,	Erie.
Newman, A. C.,	Albion,	Erie.
Springer, R. E.,	Uniontown,	Fayette.
Dunn, J. C.,	Tionesta,	Forest.
Miller, D. L.,	Waynesboro,	Franklin.
Seylar, L. W.,	McConnellsburg,	Fulton.
Ullom & Bailey,	Waynesburg,	Greene.
Steel, H. E.,	Huntingdon,	Huntingdon.
Allison, Elmer E.,	Indiana,	Indiana.
Henderson & Craig,	Brookville,	Jefferson.
Crawford, M. P.,	Mifflintown,	Juniata.
McKinley & Frantz,	New Castle,	Lawrence.
White, W. D. & Co.,	Wilkes-Barre,	Luzerne.
Walton, L. L. & Co.,	Williamsport,	Lycoming.
Studholme Bros.,	Port Allegany,	McKean.
West, Harry D.,	Greenville,	Mercer.
Muthersbough, J. A.,	Lewistown,	Mifflin.
Flagler, Steward,	Stroudsburg,	Monroe.
Huzzard, Curtis,	Norristown,	Montgomery.
King, A. J.,	Ardmore,	Montgomery.
Gosh, W. E.,	Danville,	Montour.
Weaver's Phar.,	Easton,	Northampton.
Armstrong, W. K.,	Sunbury,	Northumberland.
Johnston, Dr. A. R.,	New Bloomfield,	Perry.
Armstrong, C. O.,	Milford,	Pike.
Robertson, J. W.,	Galeton,	Potter.
Thompson, M. S. & Co.,	Coudersport,	Potter.
Cowen, W. S.,	Pottsville,	Schuylkill.
Krebs, H. J.,	Mahanoy City,	Schuylkill.
Snook, A. E.,	Middleburg,	Snyder.
Picking, J. S.,	Somerset,	Somerset.
Buschhausen, A. H.,	Laporte,	Sullivan.
Morris, F. D.,	Montrose,	Susquehanna.
Blatchley, H. L.,	Wellsboro,	Tioga.
Curtis, Guy H.,	Franklin,	Venango.
Pierce, Wm. S.,	Warren,	Warren.
Valentine Bros.,	Washington,	Washington.
Jadwin, C. C.,	Honesdale,	Wayne.
Martin, A. E.,	Greensburg,	Westmoreland.
Sickler, H.,	Tunkhannock,	Wyoming.
Lafean, A. H. & Bro.,	York,	York.

METHOD OF DISTRIBUTION.

After appointment the distributor is furnished with an initial supply of immunizing doses of 1,500 units each of tetanus antitoxin commensurate with the territory to be covered from this station, with the idea in mind—as tetanus antitoxin is effective if used within 48 hours,—to so locate these stations as to make the supply accessible to those meeting with accidents anywhere in Pennsylvania within the prescribed time, together with blank forms, stamped envelopes, etc., necessary for its distribution, copies of which forms are herewith shown:—

Form B. P. 536.

COMMONWEALTH OF PENNSYLVANIA.

DEPARTMENT OF HEALTH.

APPLICATION AND RECEIPT FOR TETANUS ANTITOXIN.

............................19....

I hereby acknowledge receipt of the following named amount of Tetanus Antitoxin:
........packages containing 1,500 units. Laboratory Nos.............
from, ... Distributor. Address,........................
in the name of the Department of Health. I hereby certify that the persons mentioned for whose treatment the Antitoxin is furnished are indigent and unable to otherwise procure the same. I agree to make no charge for it directly or indirectly, and if unused to return it to the distributor; also to mail to the Department of Health, immediately upon termination, a clinical report for each case, on the blanks furnished for this purpose.

We have in stock at this time:
........packages 1,500 units.

....
(Physician's Signature)
....
(Address)

....
(Distributor's Signature)
....
(Full Address)

Form B. P. 536.

Blue Stub.

COMMONWEALTH OF PENNSYLVANIA.

DEPARTMENT OF HEALTH.

APPLICATION AND RECEIPT FOR TETANUS ANTITOXIN.

............................19....

I hereby acknowledge receipt of the following named amount of Tetanus Antitoxin:
........packages containing 1,500 units. Laboratory Nos.............
from, ... Distributor. Address,........................
in the name of the Department of Health. I hereby certify that the persons mentioned for whose treatment the Antitoxin is furnished are indigent and unable to otherwise procure the same. I agree to make no charge for it directly or indirectly, and if unused to return it to the distributor; also to mail to the Department of Health, immediately upon termination, a clinical report for each case, on the blanks furnished for this purpose.

We have in stock at this time:
........packages 1,500 units.

....
(Physician's Signature.)
....
(Address.)

....
(Distributor's Signature.)
....
(Full Address.)

Form B. P. 537.

Tetanus Antitoxin.

.... Units.

Manufacturer.

....

Laboratory No.

Date within which the unopened container or attached slip must be returned to
Distributor, ...

....

COMMONWEALTH OF PENN'A.

DEPARTMENT OF HEALTH.

Tetanus Antitoxin,................Units.
Manufacturer,........ Laboratory No....
Patient, ... Address,..........
Date of use,..............................
Physician's signature,..................
Physician's address,.....................
Distributor's signature,..................
Distributor's address,....................
This slip when returned to Distributor must be forwarded by him to the Department of Health, together with the application for the same.

SAMUEL G. DIXON, Commissioner.

Form B. P. 538.

COMMONWEALTH OF PENNSYLVANIA.

DEPARTMENT OF HEALTH.

REPORT OF PROPHYLACTIC TREATMENT WITH TETANUS ANTITOXIN

Use a separate blank for each case and forward immediately upon the termination of the same to the Department of Health, Harrisburg, Pa.

Patient's name, ... Address,................ County,................Pa.
Age,................ Sex,........................... Color,..........................
Nature of wound.......... Gunshot,........ Puncture,........ Other Injury,........

(Cross out class of injury not applicable.)

Location and extent of wound,..
....
Cause of injury,...
Date and hour of accident,..
(Hour) (Day) (Month) (Year)

SPECIFY AMOUNT OF ANTITOXIN USED.

................units........hours after accident. Lab. No.........
................units........hours after first treatment. Lab. No.........
................units........hours after second treatment. Lab. No.........
State complications if any,..
Did patient subsequently develop tetanus? Yes No State termination Recovery Death with date
Remarks, ...
....
Distributor's Name,........................ Signature,.......................M. D.
Address,.................................... Address,................................

Form B. P. 536 is the application and receipt, yellow in color, to be signed by the physician upon making application for the antitoxin for use on indigent patients. The signature also appears on the blue stub which remains as a record in the book of the distributor.

Form B. P. 537 is the little yellow slip found around the outside of the package of antitoxin which is to be filled out by the physician, giving name of patient and address, date of use, physician's name and address and forwarded with Forms B. P. 536 above mentioned to the Department.

Form B. P. 538, being the clinical report, gives the complete medical record, or history of the case from the beginning of treatment to either recovery or death and is to be signed by the physician and sent to the Department immediately upon termination of the case. These three forms when properly filled out make a complete record of each case.

The following table of immunization treatments with tetanus antitoxin gives age, sex, color, nature of wound, time of treatment after accident, result and number of units used for the year 1911.

STATEMENT OF IMMUNIZATION TREATMENT WITH TETANUS ANTITOXIN FOR THE YEAR 1911.

Age.	Sex		Color		Nature of Wound.				Time of Treatment.		No. of units used.	No. of cases.	Developing Tetanus.
	M.	F.	W.	B.	Gun-shot.	Puncture.	Other injury.	4th of July.	Within 48 hours.	Over 48 hours.			
18,	1	0	1	0	1	0	0	0	0	180	3,000	1	0
9,	1	0	1	0	0	1	0	0	24	0	1,500	1	0
16,	1	0	1	0	0	0	0	1	24	0	1,500	1	0
12,	1	0	1	0	0	0	0	1	48	0	3,000	1	0
8,	1	0	1	0	0	0	0	1	1	0	1,500	1	0
19,	1	0	1	0	0	0	0	1	24	0	1,500	1	0
8,	1	0	1	0	0	0	1	0	12	0	3,000	1	0
19,	1	0	1	0	1	0	0	0	24	0	1,500	1	0
6,	0	1	1	0	0	0	1	0	28	0	1,500	1	0
16,	1	0	1	0	0	0	1	0	24	0	1,500	1	0
11,	1	0	1	0	1	0	0	0	36	0	1,500	1	0
11,	1	0	1	0	0	0	1	0	36	0	1,500	1	0
16,	1	0	1	0	0	0	1	0	36	0	1,500	1	0
12,	1	0	1	0	0	0	1	0	36	0	1,500	1	0
14,	1	0	1	0	0	0	1	0	36	0	1,500	1	0
6,	1	0	1	0	0	0	0	1	½	0	1,500	1	0
15,	1	0	1	0	0	0	0	1	20	0	1,500	1	0
56,	1	0	1	0	0	0	1	0	30	1	1,500	1	0
27,	1	0	1	0	0	1	0	0	44	0	1,500	1	0
17,	1	0	1	0	0	0	1	0	12	0	1,500	1	0
36,	1	0	1	0	0	0	1	0	24	0	1,500	1	0
55,	1	0	1	0	0	1	0	0	24	0	1,500	1	0
3,	0	1	1	0	0	1	0	0	0	72	3,000	1	0
4,	1	0	1	0	0	1	0	0	48	0	7,500	1	0
36,	1	0	1	0	0	0	1	0	0	168	1,500	1	0
4,	1	0	1	0	0	1	0	0	12	0	1,500	1	0
8,	1	0	1	0	0	0	1	0	30	0	1,500	1	0
17,	1	0	1	0	0	0	1	0	24	0	1,500	1	0
18,	1	0	1	0	0	0	1	0	24	0	1,500	1	0
9,	1	0	1	0	0	0	0	1	32	0	1,500	1	0
14,	1	0	1	0	0	0	0	1	3	0	1,500	1	0
16,	1	0	1	0	1	0	0	0	24	0	1,500	1	0
8,	1	0	1	0	0	1	0	0	13	0	1,500	1	0
30,	1	0	1	0	0	1	0	0	5	0	1,500	1	0
18,	1	0	1	0	1	0	0	0	24	0	1,500	1	0
5,	1	0	1	0	0	1	0	0	24	0	1,500	1	0
14,	1	0	1	0	0	0	0	1	½	0	1,500	1	0
14,	1	0	1	0	0	0	0	1	1	0	3,000	1	0
15,	1	0	1	0	0	0	0	1	12	0	1,500	1	0
17,	1	0	1	0	0	0	0	1	3	0	1,500	1	0
42,	1	0	1	0	0	0	1	0	24	0	1,500	1	0
42,	1	0	1	0	0	0	1	0	0	108	1,500	1	0
14,	0	1	1	0	0	0	0	1	18	0	1,500	1	0
50,	1	0	1	0	0	0	1	0	24	0	1,500	1	0
21,	1	0	1	0	0	1	0	0	16	0	1,500	1	0
9,	1	0	1	0	0	0	0	1	1½	0	1,500	1	0
41,	0	1	1	0	0	0	0	1	36	0	1,500	1	0
16,	1	0	1	0	0	0	0	1	5	0	1,500	1	0
28,	1	0	1	0	0	0	0	1	7	0	1,500	1	0
14,	1	0	1	0	0	0	0	1	5	0	1,500	1	0
21,	1	0	1	0	0	0	1	0	0	120	3,000	1	0
20,	1	0	1	0	0	0	0	1	42	0	1,500	1	0
19,	1	0	1	0	1	0	0	0	16	0	1,500	1	0
40,	1	0	1	0	0	0	1	0	4	0	3,000	1	0
5,	1	0	1	0	0	0	0	1	36	0	1,500	1	0
16,	1	0	1	0	1	0	0	0	2	0	1,500	1	0

STATEMENT OF IMMUNIZATION TREATMENT WITH TETANUS ANTITOXIN FOR THE YEAR 1911—Continued

Age.	Sex		Color		Nature of Wound.				Time of Treatment.		No. of units used.	No. of cases.	Developing Tetanus.
	M.	F.	W.	B.	Gun-shot.	Puncture.	Other injury.	4th of July.	Within 48 hours.	Over 48 hours.			
14,	1	0	1	0	0	0	0	1	24	0	1,500	1	0
18,	1	0	1	0	0	0	0	1	2½	0	1,500	1	0
13,	1	0	1	0	0	0	0	1	0	76	3,000	1	0
37,	1	0	0	1	0	1	0	0	30	0	1,500	1	0
8,	0	1	1	0	0	0	1	0	46	0	3,000	1	0
7,	1	0	1	0	0	1	0	0	25	0	1,500	1	0
14,	1	0	1	0	0	0	0	1	0	72	3,000	1	0
10,	1	0	1	0	0	0	0	1	0	72	3,000	1	0
13,	1	0	1	0	0	0	0	1	0	63	3,000	1	0
9,	1	0	1	0	0	0	1	0	3	0	1,500	1	0
10,	1	0	1	0	0	0	1	0	7	0	1,500	1	0
13,	1	0	1	0	1	0	0	0	3	0	1,500	1	0
5,	0	1	0	1	0	1	0	0	3	0	1,500	1	0
12,	1	0	1	0	1	0	0	0	12	0	1,500	1	0
14,	1	0	1	0	1	0	0	0	12	0	1,500	1	0
51,	1	0	1	0	0	0	1	0	0	50	3,000	1	0
25,	0	1	1	0	1	0	0	0	4	0	1,500	1	0
14,	1	0	1	0	1	0	0	0	15	0	1,500	1	0
67,	1	0	1	0	0	1	0	0	0	96	1,500	1	0
38,	1	0	1	0	0	1	0	0	46	0	1,500	1	0
15,	1	0	1	0	1	0	0	0	1	0	1,500	1	0
16,	1	0	1	0	0	1	0	0	0	192	1,500	1	0
10,	1	0	1	0	0	1	0	0	24	0	1,500	1	0
12,	1	0	1	0	0	0	0	1	48	0	1,500	1	0
42,	0	1	1	0	0	1	0	0	0	88	1,500	1	0
15,	1	0	1	0	0	0	0	1	6	0	1,500	1	0
12,	0	1	1	0	0	1	0	0	0	120	1,500	1	0
	74	9	81	2	13	19	23	28	69	14	150,000	83	0

The following table shows the curative treatment of tetanus cases using immunizing doses of tetanus antitoxin of 1,500 units each from January 1st to December 31st, 1911:—

TABLE

SHOWING RESULTS OF CURATIVE TREATMENT OF TETANUS CASES WITH ANTITOXIN FOR THE YEAR 1911.

Age.	Sex		Color		Nature of Wound.				Time of Treatment.		No. of units used.	Recoveries.	Deaths.
	M.	F.	W.	B.	Gun-shot.	Puncture.	Other injury.	4th of July.	Within 48 hours.	Over 48 hours.			
5,	1	0	1	0	0	0	1	0	0	168	13,500	0	1
37,	1	0	1	0	0	0	1	0	0	516	6,000	0	1
14,	1	0	1	0	0	1	0	0	0	264	7,500	0	1
10,	1	0	1	0	0	1	0	0	....	....	70,000	1	0
18,	1	0	1	0	0	0	1	0	0	192	15,000	0	1
35,	0	1	1	0	0	1	0	0	0	144	60,000	0	1
16,	1	0	1	0	0	0	1	0	0	192	3,000	0	1
37,	1	0	1	0	0	1	0	0	0	336	12,000	1	0
23,	1	0	1	0	0	0	1	0	0	120	6,000	1	0
14,	1	0	1	0	0	0	1	0	0	144	3,000	0	1
7,	0	1	1	0	0	0	1	0	12	0	3,000	0	1

Age.	Sex		Color		Nature of Wound.				Time of Treatment.		No. of units used.	Recoveries.	Deaths.
	M.	F.	W.	B.	Gun-shot.	Puncture.	Other injury.	4th of July.	Within 48 hours.	Over 48 hours.			
16,	1	0	1	0	0	0	1	0	0	144	6,000	0	1
17,	1	0	1	0	0	0	1	0	0	72	6,000	0	1
32,	0	1	1	0	0	0	1	0	24	0	3,000	0	1
14,	1	0	1	0	0	1	0	0	0	360	3,000	1	0
53,	0	1	1	0	0	0	1	0	24	0	3,000	0	1
3,	0	1	1	0	0	0	1	0	0	96	6,000	0	1
4,	1	0	1	0	0	0	1	0	0	177	1,500	1	0
21,	1	0	1	0	0	0	1	0	0	72	1,500	0	1
43,	1	0	0	1	0	0	1	0	0	432	21,000	0	1
8,	0	1	1	0	0	1	0	0	0	120	3,000	0	1
37,	1	0	1	0	0	1	0	0	0	237	1,500	0	1
47,	1	0	1	0	0	0	1	0	0	96	3,000	0	1
15,	1	0	1	0	0	1	0	0	0	336	4,500	1	0
10,	1	0	1	0	0	1	0	0	Unknown		4,500	0	1
32,	1	0	1	0	0	0	1	0	Unknown		1,500	0	1
19,	1	0	1	0	0	1	0	0	0	504	7,500	0	1
	21	6	26	1	0	10	17	0	....	....	275,500	6	21

The following statements give a concise summary of the whole number of cases treated with tetanus antitoxin for immunization and cure, number of deaths, number of recoveries, number of packages used, initial number of packages supplied to the 67 stations and net cost of supplying same for the years 1910 and 1911:—

1910.

Total number of cases treated for cure,	16
Number of deaths,	14
Number of recoveries,	2
Number immunized,	76
Number immunized and developing tetanus,	0
Total number treated for cure and immunization,	92
Total number of packages of Antitoxin used in 1910,	241
Initial supply of packages to 67 distributing stations,	611
Net cost of supplying to 67 distributing stations,	$722.40

1911.

Total number of cases treated for cure,	27
Number of deaths,	21
Number of recoveries,	6
Number immunized,	83
Number immunized and developing tetanus,	0
Total number treated for cure and immunization,	110
Total number of packages of Antitoxin used in 1911,	202
Additional supplies of packages to 30 distributing stations,	144
Refrigerator stock,	100
Net cost of supplying to 30 distributing stations,	$292.80

Division of Sanitary Engineering.

F. HERBERT SNOW, C. E., *Chief Engineer.*

THE DIVISION OF SANITARY ENGINEERING

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DIVISION OF ENGINEERING.

The following is a detailed statement of the operation of the Engineering Division of the State Department of Health to the end of the year 1911, being the Sixth Annual Report of the Division made since the creation of the Department of Health.

1. ORGANIZATION AND ADMINISTRATION.

1. OFFICE AND OFFICE FORCE.

Mr. F. Herbert Snow has continued throughout the year to discharge the duties of his position as Chief of the Engineering Division of this Department.

The offices of the Division are on the ground floor front, and enthresol floor, north corridor, and on the fifth floor, south corridor, of the Capitol.

Six sub-divisions of the organization have been created in the administration of the work put upon the office, namely: That of general office; that pertaining to water works and sewerage applications; that relating to special investigations; that relating to design and construction; that of map making, and finally, that of sanitary regulation.

There have been employed in the office 11 stenographers and 13 clerks.

2. ASSISTANT ENGINEERS.

Mr. Paul Hooker has acted as principal assistant engineer in charge of water works and sewerage investigations. He conducted the Department's operations at Parker City during the typhoid fever epidemic there and he looked after the water works at Austin after the flood disaster of September 30th.

Mr. Charles A. Emerson, Jr., principal assistant engineer, in charge of designs and construction, supervised the work done by the Department at Mont Alto, Cresson, Hamburg, Polk and Wernersville, and also the map making in the drafting room. Aside from these duties, Mr. Emerson made investigations and reports for the engineering division on the sewerage for the Western Pennsylvania Hospital for the Insane, Dixmont, Allegheny County; the reservoir at the Eastern Pennsylvania State Institution for the Feeble Minded and Epileptic, Spring City, Chester County; the sewerage of the Norristown State Hospital for the Insane; the sewerage for the city of Harrisburg; the sewage disposal of the Epileptic Colony, Oakborne, Westtown Township, Chester County. He investigated the private sewage disposal on the farm of Henry McKane Ingersoll, Esq., and prepared plans for a disposal plant for this sewage. Mr. Emerson was one of the Department engineers on the relief work at the time of the Austin flood disaster and made an inventory and report upon the material used in the rescue work. He also prepared a detailed report on the water supply of the Moreland Spring Water Company at Jenkintown, Pa., based on investigations made during the latter part of 1910.

Mr. Charles H. Cummings continued as principal assistant engineer in charge of general office work. Mr. H. P. Rees assisted Mr. Cummings throughout the year. Mr. Warren F. Warlow also assisted in the office work until June 1st. The position made vacant by his resignation was filled for the remainder of the year by Harry T. Campion.

Mr. Ralph E. Irwin performed the duties of principal assistant engineer in charge of tests of water purification and sewage treatment plants and has also performed work in the field supervising the suppression of several typhoid fever epidemics as will hereinafter appear.

Mr. William H. Ennis, Mr. Howard E. Moses and Mr. William C. Riddle continued as assistant engineers on investigation of water works and sewerage systems. Mr. Ennis and Mr. Moses had responsible supervision over the suppression of typhoid fever epidemics at several places throughout the year and their reports are quoted freely herein under the heading of Typhoid Fever Epidemics. Mr. Moses performed special service at Austin in connection with relief work done by the Department after the flood disaster of September 30th. Mr. Riddle was also on duty at Austin.

Mr. John M. Mahon, Jr., assistant engineer, devoted the greater part of the year to office work in connection with the estimates and surveys for the Pennsylvania State South Mountain Sanatorium, Mont Alto and the State Sanatorium for Tuberculosis at Cresson, and on preliminary work for the State Sanatorium for Tuberculosis at Hamburg. Mr. Mahon also prepared the annual report of the Design and Construction Section for the year 1910. He also made the following investigations and prepared reports based upon them for the Engineering Division: the sewerage problems of Shippensburg Borough, Cumberland County; the sewage disposal plant of the Lehigh County Home; the sewerage of Port Royal Borough, Juniata County; the water works of the Marion Center Water Company, Marion Center, Indiana County, and of the Treverton Water Supply Company, Treverton, Northumberland County. He also made an investigation and report on the sewage disposal of the Athletic Club of Philadelphia, Manoa, Delaware County.

Mr. Abner H. Beard, assistant engineer, devoted the entire year to the construction work at the Pennsylvania State Sanatorium for Tuberculosis near Cresson.

Mr. Coleman B. Mark was employed on the construction work at Cresson between February 1st and April 30th, May 16th and June 30th, December 17th and December 31st. He also was employed on the construction at Mont Alto between May 1st and 15th, as well as on the repairs to the sewage disposal plant at the State Institution for Feeble Minded of Western Pennsylvania at Polk. He was employed on drafting on township maps during the month of January and on a field investigation of the sewage disposal plant at Devon, during July and attended to general office work during the month of November.

Mr. Moylan E. Shaughnessy, assistant engineer, was engaged throughout the year on special sanitary investigations largely in connection with the work of stream inspection.

Mr. Charles R. Forbes was employed for the entire year on construction work at Mont Alto.

Mr. Harry A. Otto was employed as an engineering draftsman on general construction work for the time until May 31st, when he resigned from the Department.

Mr. J. Raymond Hoffert was appointed on September 1st, and employed his time on Mont Alto construction drafting between September 1st and 15th; on Cresson construction drafting between September 16th and November 30th, and on the details of the State College sewage disposal plant between December 1st and 31st when he resigned from the Department to accept a more responsible position with the Park Board of the City of Harrisburg as engineer and assistant superintendent.

3. ENGINEERING ASSISTANTS.

Under Mr. Irwin, Messrs. Max Matthes, Chas. T. Maclay, Wilson W. Ritter, Roland B. Styer and Ira F. Zeigler were engaged in making tests of water purification and sewage disposal plants and in other work of a like nature. They also collected samples for analyses.

Mr. James L. W. Gibbs continued as Chief Draftsman in charge of map making throughout the year under the immediate direction of Mr. Emerson. He did special work for the Medical Division from May 1st to 15th and during the entire month of October.

Mr. John W. German, Jr., was employed for the entire year in the drafting room with the exception of the time between February 1st and 15th and between August 17th and September 4th, when he was employed on work for the Medical Division.

The draftsmen in the force under Mr. Gibbs were as follows:

Chester A. Eckbert, F. Marion Sourbeer, Ivan M. Glace, I. L. Miller, G. Douglass Andrews, C. Richard Krall, Charles L. Andrews, C. F. Orth. These men were employed on map making work in the drafting room except as noted opposite each name.

Mr. Chester A. Eckbert was employed on construction work at Mont Alto from August 21st to 31st, and on work for the Medical Division between February 1st and 15th and between September 1st and 9th.

Mr. F. Marion Sourbeer was employed on work for the Medical Division between February 1st and 18th, May 21st and June 8th, July 26th and 29th, August 27th and 30th, September 1st to 7th, and 20th to 28th, August 2nd and 7th.

Mr. Ivan M. Glace was employed on work for the Medical Division between February 1st and 9th and between September 1st and 6th.

Mr. Ira L. Miller was employed on work for the Medical Division between January 26th and February 15th, and between August 28th and 31st.

Mr. G. Douglass Andrews was employed on construction work at Mont Alto between September 1st and 20th, October 1st and 27th and November 29th and December 31st.

Mr. Chas. L. Andrews was appointed on June 1st.

Mr. C. F. Orth was appointed on June 1st.

Mr. George E. Williams was employed on drafting work in connection with Cresson between January 25th and March 21st, April 1st and 11th, May 19th and 22nd. He did drafting work for the Mont Alto construction between April 11th and May 18th, June 1st and 16th, August 1st and 15th, October 15th and 31st. He also was employed on office work in connection with the repairs to the sewage disposal plant of the State Institution for Feeble Minded of Western Pennsylvania at Polk between July 8th and 18th, and on the Devon sewage disposal plant case between July 19th and 31st.

Mr. Richard Krall was employed on construction work at Mont Alto between June 1st and December 31st.

4. SANITARY INSPECTORS.

Mr. M. K. Ely has continued as the Chief Sanitary Inspector in charge of sanitary inspection and having supervision of all field inspectors.

Besides the sanitary inspectors in the employment of the Department at the beginning of the year, five new sanitary inspectors were appointed by the Commissioner of Health. The name, place of residence and date of appointment of each are given below:

E. I. Confer, April 17, 1911, Millmont, Pa.
Michael A. Barrett, April 17, 1911, Philadelphia.
Thomas Burke, April 17, 1911, Philadelphia.
William Davis, May 9, 1911, Pittsburgh.
J. C. Yeager, May 15, 1911, Lewistown.

Deputy field officers , so called because while being in the employ of a private corporation, they were deputized to represent the Commissioner of Health in inspecting the sanitary conditions of properties and reporting results to him, discharged their duties of the office during the year and are named in the following table:

H. N. Blunt, Palmerton, June 1906.
Wm. G. Edmunds, Nanticoke, June 1906.
Howard Seabold, Catasauqua, November 1906.
E. M. Stack, Scranton, April 1908.
John Brown, Scranton, April 1908.
David Decker, Ridgway, June 1908.
Scott Bailey, DuBois, May 1909.
F. D. Eagle, Butler, March 1909.
D. M. Watt, Butler, March 1909.
John Coslett, Scranton, May 1910.

5. REGULAR FORCE.

On December 31st, 1911, the regularly employed force in the Engineering Division consisted of 13 assistant engineers, 5 engineering assistants, 11 draftsmen, 12 clerks, 11 stenographers and 55 sanitary inspectors. The names given alphabetically will be found elsewhere in the report of the Commissioner of Health, and as follows:

Assistant Engineers

Abner H. Beard	Designs and Construction.
C. Howe Cummings	Principal Assistant in Charge General Office Work.
C. A. Emerson, Jr.	Principal Assistant in charge of Designs and Construction
William H. Ennis	Principal Assistant in Charge of Special Investigations.
Charles R. Forbes	Designs and Construction.
Paul Hooker	Principal Assistant in Charge of Water Works and Sewerage Investigations.
Ralph E. Irwin	Principal Assistant in Charge of Tests of Water and Sewage Treatment.
John M. Mahon, Jr.	Designs and Construction.
Howard E. Moses	Water Works and Sewerage Investigations.
Horace P. Rees	General Office Work.
William C. Riddle	Water Works and Sewerage Investigations.
Moylan E. Shaughnessy	General Investigations.
Coleman B. Mark	Designs and Construction.

Engineering Assistants

Charles T. Maclay	Tests of Water and Sewage Treatment.
Max H. Matthes	Tests of Water and Sewage Treatment.
Wilson W. Ritter	Tests of Water and Sewage Treatment.
Roland B. Styer	Tests of Water and Sewage Treatment.
Ira F. Zeigler	Tests of Water and Sewage Treatment.

Draftsmen

Charles L. Andrews	
G. Douglass Andrews	
Chester A. Eckert	
John W. German, Jr.	
James L. W. Gibbs	Chief Draftsman.
Ivan M. Glace	
C. Richard Krall	
Ira L. Miller	
C. F. Orth	
F. Marion Sourbeer	
George E. Williams	

Clerks

Beckley, Harry C.	Clerk of Sanitary Inspection Work.
Bohl, Andrew J.	Clerk of Sanitary Inspection Work.
Campion, Harry T.	Clerk of General Office Work.
Einstein, Richard F.	Clerk of Sanitary Inspection Work.
Haines, Howard M.	Clerk of Sanitary Inspection Work.
Miller, John K.	Clerk of Sanitary Inspection Work.
Ness, Daniel V.	Chief Clerk in Charge of Nuisance Complaints.
Pretty, Nellie S.	Clerk Plan Files.

Clerks—Continued.

Rourke, Edith	Clerk of Sanitary Inspection Work
Styer, R. K.	Clerk (Multigraph Work).
Trace, Lila Hamill	Clerk of Correspondence Files.
Wanbaugh, William C.	Clerk of Water and Sewage Testing Section.

Stenographers

Cuenot, M. Irene
Eckels, M. Louise
Fleisher, Elizabeth R.
Gilbert, Jane
Hannah, Leola
Hurst, M. Ethel
Mahaney, Clara V.
Moore, Anna E.
Russell, Mary E.
Smith, Frances W.
Sourbeer, Mary K.

Sanitary Inspectors

Andrews, Henry	Field Officer.
Aurand, James B.	Field Officer.
Barrett, Michael A.	Field Officer.
Carson, W. G.	Field Officer.
Clark, James M.	Field Officer in Charge.
Claypoole, William K.	Field Officer.
Collins, Charles W.	Field Officer.
Confer, E. I.	Field Officer.
Conrad, Andrew W.	Field Officer.
Considine, John J.	Field Officer. in Charge.
Couch, Joseph S.	Field Officer.
Courtney, R. M.	Field Officer.
Dale, Jesse E.	Field Officer in Charge.
Davis, William	Field Officer.
Eisenhart, John W.	Field Officer.
Ellis, William	Field Officer in Charge.
Ely, Moses K.	Chief Sanitary Inspector.
Engle, Simon B.	Field Officer
Evans, Edward H.	Field Officer.
Frederick, Morris Z.	Field Officer.
Haldeman, L. S.	Field Officer.
Hansbury, Robert S	Field Officer.
Hellings, Joseph M.	Field Officer.
Hood, Warren S.	Field Officer in Charge.
Imler, Lincoln S.	Field Officer.
Irwin, D. M.	Field Officer.
Jarrett, Charles P.	Field Officer.
Kauffman, Harry S.	Special Field Officer.
Lanard, Frank H.	Field Officer.
Laughlin, John Henry	Field Officer.
Magee, Harry E.	Field Officer.
Marshall, D. J.	Field Officer.
McCleary, J. A.	Field Officer.
Miller, Harry A.	Field Officer in Charge.
Moore, Howard B.	Field Officer in Charge.
Morris, William H.	Field Officer.
Nickel, Otto F.	Field Officer.
Nicholson, Thos. P.	Field Officer.
Nightingale, John B.	Field Officer in Charge.
Oates, John J.	Field Officer.
Pierce, Lester L.	Field Officer.
Reno, W. W.	Field Officer.
Rice, W. E.	Field Officer.
Roebuck, Joseph W.	Field Officer.
Silliman, J. H.	Field Officer.
Slagle, L. N.	Field Officer.
Spelker, Charles H.	Field Officer.
Souder, Roy M.	Field Officer in Charge.
Stewart, James H.	Field Officer.
Teats, William R.	Field Officer.
Thompson, I. D.	Field Officer.
Vare, R. S.	Field Officer in Charge.
Whelan, Timothy	Field Officer.
Yeager, J. C.	Field Officer.
Zellers, Daniel M.	Field Officer.

Mr. E. T. Edwards, City Health Officer for Johnstown, has continued to represent the Department as a special sanitary inspector in the immediate territory beyond the jurisdiction of that city.

6. LOCAL HEALTH OFFICERS.

To better administer the work of the Department throughout the 1500 and over second class townships of the Commonwealth, wherein reside over two and a third million persons entirely without sanitary protection such as is afforded by the Boards of Health of first class townships and the boroughs of Pennsylvania, the Commissioner of Health in the year 1907 had the State—66 counties excluding Philadelphia—divided into sanitary districts totalling 733 for each of which he appointed a resident agent.

In this division, so far as possible and practicable, township boundaries were followed. Usually a district comprises two or more townships, including the boroughs and cities therein. For instance, Logan Township, Blair County, including with it Altoona City and Juniata Borough comprises a district. The City of Pittsburgh proper is a district by itself.

The resident sanitary agent of the Commissioner of Health in so far as his duties relate to the Medical Division of the Department, is confined to the territory wholly without the borough, city and first class township because these municipalities are required by law to have their own organized boards of health; but everywhere within his district regardless of the municipal boundaries, the resident sanitary agent is expected to investigate stream pollutions, water works and sewers, to render assistance to field officers and to report to the chief of the Engineering Division.

The work performed for the Engineering Division of the Department appears elsewhere herein.

II. OFFICE WORK.

The general office work necessary to administer the operations of the Division, including general correspondence, recording corporation reports and plans required by law to be filed in the office of the Department or in compliance with decrees of the Commissioner, attention to petitions and complaints, the issuing of orders for the abatement of nuisances and menaces, and the preparation of plans of watersheds for the use of sanitary inspectors in the field, comprises the subjects treated of in this part of the report under the head of office work. More or less office work is performed in connection with the sub-divisions of the organization and it is mentioned elsewhere.

7. CORPORATION REPORTS.

Under provisions of Law No. 182 of the Acts of the Assembly of Pennsylvania, approved April 22nd, 1905, entitled "An Act to Preserve the Purity of the Waters of the State, for the Protection of the Public Health," it is the duty of every municipal corporation, private corporation, company and individual supplying or authorized to supply water to the public within the State to file with the Commissioner of Health a certified copy of the plans and surveys of the water works, with a description of the source from which the supply of water is derived.

Under the provisions of the same law, it is the duty of the public authorities having by law charge of the sewer system of every municipality in the State to file with the Commissioner of Health a report of such a sewer system which shall comprise such facts and information as the Commissioner of Health may require.

Eleven (11) reports were received. Six (6) of these were from municipal corporations and five (5) were from private corporations.

The municipal returns comprised three (3) water supply reports and three (3) sewerage reports.

The private corporation reports pertained to five (5) water works systems.

The Department has now on file information obtained in this formal way relative to water supply in eight hundred and seventy-five (875) places and relative to sewerage in four hundred and fifty-three (453) places.

These are the initial reports submitted with respect to water works and sewerage systems in operation at the time of the creation of the Department and are exclusive of the reports submitted with applications for permits from the Commissioner of Health, which permits must be obtained before old systems can be legally extended or new ones installed. These applications are mentioned elsewhere in this report.

8. RECORDED PLANS.

On December 31st, 1911, there were 10,795 plans officially registered in the Department, 1,577 having been added during the year; and of the grand total 4,084 accompanied water works and sewerage reports, of which 198 were added during the year; 4,380 accompanied water works and sewerage applications, of which 941 were added during the year; and 2,331 were of miscellaneous character, including some of the office working maps and those used in field engineering and inspection work, of which 438 were added durng the year.

9. PETITIONS AND COMPLAINTS.

The Commissioner of Health, in addition to the powers conferred by the new law, has all the powers conferred and must perform all the duties heretofore imposed by law upon the former State Board of Health, or any member, committee or officer thereof, including the Secretary. The work of supervising the general interests of the health and lives of the citizens of the Commonwealth has been done in part in answer to petitions and complaints and requests for advice. The Commissioner's instructions to give prompt attention to petitions, complaints and requests have been complied with in so far as the Department's force made it possible.

Hundreds of communications relative to stream pollutions by sewage or by industrial waste, or with respect to unsanitary conditions, inferior water supply or ice supply and respecting sewers, sewage disposal, water supply and general sanitation have received attention.

Six hundred and thirty-six (636) complaints and petitions have been acted upon during the year. Six hundred and twenty-six (626) of these cases have been satisfactorily settled.

Forty-three (43) requests for advice relative to sewage, waste water and garbage disposal and to the location and construction of cesspools, slaughter houses and pig pens have been answered.

Common nuisances located within the territory of municipalities having organized boards of health and made the subjects of complaints to the Commissioner of Health, have been referred by the Department to such local boards. There have been two hundred and thirty-seven (237) references of this kind during the year as follows; and at the close of the year all but four (4) of these cases have been reported by the various boards of health as being abated:

Stream Pollution. Bangor, Brockwayville, Coatesville, Collegeville, Dallastown, Delaware Water Gap, Dickson City, Ephrata, Grove City, Hanover, Hazleton, LeRaysville, Mansfield, Marysville, Monessen, Radnor Township, Delaware County, Sharon, St. Petersburg, Sugar Grove and Wyoming. (20)

Sewage in Street Gutters. Bentleyville, Chester, Collingdale, Dravosburg, DuBois,, Eldred, Erie, Hamburg, Hollidaysburg, Kennett Square, Larksville, Minersville, Monongahela, Mt. Union, Nether Providence Township, Delaware County, New Holland, Oakland, Pottstown, Rutledge, Utica and Wilmore. (21)

Sewer Outlets. Beallsville, Bellevue, Catasauqua, Doylestown, Turtle Creek and Waterford. (6)

Defective Sewers. Beaver Falls, Bellevue, Brookville, Columbia, Edwardsville, Huntingdon, New Bethlehem, Pitcairn, Shippensburg. (9)

Open Sewers. Mt. Pleasant, Pottsville, Sharon. (3)

Unsanitary Premises. Abington Township, Montgomery County, Aliquippa, Ashland, Austin, Avoca, Beaver Falls, Bedford, Beech Creek, Bellevue, Bloomsburg, Bridgeport, California, Carbondale, Chalfont, Charleroi, Chartiers Township, Allegheny County, Cheltenham Township, Montgomery County (2), Cherry Tree, Chester, Claysville, Coal Township, Northumberland County, Connellsville, Coraopolis (2), Curwensville, Dawson, Derry, Dillsburg, Donora (2), Dormont, Dravosburg, DuBois (2), Dunmore, East Mauch Chunk, Easton (2), Eldred (2), Elizabeth, Emaus, Erie (2), Freedom, Gettysburg, Greensburg, Greenville, Harrisburg (2), Hollidaysburg, Hulmeville, Hyde Park, Irvona, Juniata, Laceyville (2), Lebanon, Lewistown, Littlestown, Lock Haven (2), Marietta (2), Marion Centre, Martinsburg, McDonald, McKeesport, Mercer, Milton (2), Monessen (3), Monongahela, Morrisville, Mt. Carmel, Mt. Pleasant, Mt. Union, Nazareth, New Kensington, New Milford, New Oxford, Newport (3), Norristown, North East, Northumberland (2), Parnassus, Penbrook, Philadelphia, Philipsburg, Pittston, Portage, Pottstown, Radnor Township, Delaware County, Red Lion, Renovo (2), Reserve Township, Allegheny County, Rochester, Rockledge, Saltillo, Shennandoah, Shillington, Somerset, Spring Garden, State College, Summerhill, Tamaqua (2), Titusville, Towanda, Trainer, Troy, Turtle Creek (2), Tyrone, Uniontown, Upper Darby, Verona, Versailles, Washington, Wattsburg, West End, West Pittston (3), Wilkinsburg, Wyalusing, Yardley, York. (135)

Dumping Grounds. Beaver Falls, Bellevue, Bloomsburg, Columbia, Kingston, Lehighton, Lock Haven, Manheim, Media, Northumberland, Pittston, Renovo, Sharon. (13)

Dead Animals. Dallastown, Gallitzin, Smithton (3).

Slaughter Houses. Kennett Square, Lewistown, Mifflinburg, Orrstown. (4)

Swamp Land and Stagnant Water. Auburn, Duquesne (2),Gallitzin, Glenolden, Juniata, Lansdowne, Lock Haven, Monessen, New Castle, New Kensington, Patton, (2), Parnassus, Penbrook, Seven Valley, Sunbury, Tyrone, Warrior Run, Watsontown, Yardley (21).

Impure Water and Ice Supply. Brockwayville, Shippensburg (2).

Three hundred and fifty-six (356) complaints and petitions were made the subject of special investigation and report by the Engineering Division, of which 350 have been abated. Forty-seven (47) of these commanded the services of engineers, field inspectors and County Medical Officers, and 309 commanded the services of the local health officers. Classified, these subjects were as follows:

Nuisances in streams by sewage and industrial wastes, ...	59
Impure water and ice supply, ...	22
Sewerage systems, ...	3
Garbage and night soil dumps, ...	35
Unsanitary premises, ...	140
Nuisances in street gutters by sewage, ...	42
Dead animals, ...	37
Swamp land and stagnant water, ...	15
Sewage disposal plants, ...	3
	356

The localities of the cases investigated are shown in the following statement:

Nuisances in Streams by Sewage and Industrial Wastes. In Adams County, Fairfield (2); in Allegheny County, Hampton Township, Pittsburgh and South Fayette Township; in Beaver County, New Sewickley Township and White Township; in Bedford County, Loysburg; in Blair County, Logan township and Snyder township; in Bucks County, Lower Makefield Township and Perkasie; in Cambria County, Clearfield Township and Croyle Township; in Centre County, Potter Township; in Chester County, Valley Township; in Clarion County, Richland Township, in Clearfield County, Troutville; in Clinton County, Rauchtown and Westport: in Columbia County, Jackson Township; in Cumberland County, Boiling Springs and South Middleton Township; in Dauphin County, Millersburg; in Delaware County, Chadds Ford and Ward; in Elk County, Dents Run and Ridgway; in Franklin County, Blue Ridge Summit; in Indiana County, Indiana; in Jefferson County, Heathville; in Lancaster County, Landisville and White Oak; in Lebanon County, Swatara Township; in Lehigh County, Whitehall Township; in Luzerne County, Black Creek Township and Harveys Lake, in Lycoming County, Loyalsock Township; in Montgomery County, Ardmore, Perkiomen Township, Springfield Township and West Manayunk; in Northampton County, Hellertown, Lower Saucon Township and Upper Mt. Bethel Township; in Schuylkill County, Ringtown, Wehr, West Penn Township and Zion Grove; in Somerset County, Addison Township, Brothers Valley Township, Lower Turkey Foot Township (2) and Somerset; in Susquehanna County, Lenoxville; in Venango County, Sandy Creek Township; in Washington County, Union Township; in Westmoreland County, Derry Township, in York County, Larue.

Impure Water and Ice Supply. In Adams County, Arendtsville; in Berks County, Sinking Spring (2); in Blair County, Tyrone; in Cambria County, Allegheny Township, Patton and Portage (2); in Centre County, Penn Township; in Chester County, Warwick Township; in Indiana County, Cookport; in Lackawanna County, Chinchilla; in Lancaster County, Bainbridge; in Lebanon County, Bethel Township and Campbellstown; in Luzerne County, Dupont; in McKean County, Eldred; in Northampton County, Williams Township; in Northumberland County, Hickory Corners; in Schuylkill County, West Mahanoy Township; in Tioga County, Lansing; in Wayne County, Waymart.

Sewerage Systems. In Westmoreland County, Greensburg (3).

Garbage and Night Soil Dumps. In Allegheny County, Braddock Township (2), East Deer Township, Hites, Kennedy Township, Perrysville, Robinson Township and Versailles Township; in Berks County, Mohrsville; in Bradford County, Canton Township; in Butler County, Washington Township; in Centre County, Harris Township and Rush Township; in Dauphin County, Swatara Township; in Jefferson County, Winslow Township; in Lawrence County, Wayne Township; in Lebanon County, North Lebanon Township (3); in Lehigh County, Hanover Township and Salisbury Township; in Luzerne County, Pittston Township; in Lycoming County, East Muncy; in Mercer County, Hickory Township (2); in Montgomery County, Willow Grove; in Northampton County, Lower Saucon Township and Palmer Township, in Somerset County, Addison Township; in Warren County, Conewago Township; in Washington County, Carroll Township, Cecil Township, Millsboro and North Strabane Township; in Westmoreland County, East Huntingdon Township.

Unsanitary Premises. In Adams County, Heidlersburg: in Allegheny County, Boyce Station, Dormont, Elizabeth, Hites, Hoboken, Natrona, Patton Township (2), Pittsburgh (2), Ross Township (2) and Versailles Township (2); in Armstrong County, Boggs Township, Gilpin Township, Kiskiminetas Township and Parks Township; in Beaver County, Colona; in Bedford County, Hopewell Township and West Providence Township; in Blair County, Gaysport; in Bradford County, Wysox Township, in Bucks County, Hilltown Township, Trevose and Upper Black Eddy; in Cambria County, Patton and Stony Creek Township (2); in Carbon County, Franklin Township and Palmerton; in Centre County, Howard Township; in Chester County, Glenloch and Paoli; in Clearfield County, Bigler Township, Karthaus, Sandy Township (4) and Woodland; in Clinton County, Mackeyville and Salona; in Cumberland County, Enola, Lower Allen Township and West Fairview; in Dauphin County, Clarks Valley, Linglestown, Susquehanna Township (2).,Swatara Township (2) and Wiconisco (2); in Delaware County, Chadds Ford, Haverford Township (2), Middletown Township and Upper Darby Township; in Elk County, James City; in Fayette County, German Township (2), Newell (2), South Union Township and Spring Hill Township; in Forest County, Endeavor; in Fulton County, Knobsville; in Greene County, Carmichaels; in Indiana County, Young Township; in Jefferson County, Clover Township and Rose Township; in Lackawanna County, Daleville; in Lancaster County, East Donegal Township, Fulton Township, Manheim Township, Neffville and Salunga; in Lebanon County, Annville (2), Jackson Township (2) and Palmyra; in Luzerne County, Avoca, Dupont, Hanover Township (2), Idetown and Rock Glen; in Lycoming County, Loyalsock Township (5); in McKean County, Clermont; in Mifflin County, Belleville (2) and Derry Township (2); in Monroe County, Analomink; in Montgomery County, Bryn Mawr, Fort Washington, Mont Clare, Port Kennedy, Upper Gwynedd Township (2) and White Marsh Township; in Northampton County, Lower Saucon

Township, Palmer Township and Wind Gap; in Northumberland County, Herndon and Lower Mahanoy Township; in Schuylkill County, Pine Grove Township, Porter Township and West Penn Township; in Somerset County, Listonburg and Somerset Township; in Sullivan County, Lopez; in Venango County, Clinton Township and Sugar Creek Township; in Warren County, Glade Township; in Washington County, Carroll Township (2), Cecil Township and Chartiers Township; in Wayne County, Buckingham Township; in Westmoreland County, Allegheny Township (2), Harrison City, Lower Burrell Township (3), Penn Township and Rostraver Township; in Wyoming County, Jenningsville and Nicholson Township; in York County, Cly, Fairview Township and West Manchester Township.

Nuisances in Street Gutters by Sewage. In Allegheny County, Patton Township; in Berks County, Amity Township; in Butler County, Butler Township; in Carbon County, Nesquehoning; in Clearfield County, Madera and Woodland; in Crawford County, Glyndon; in Cumberland County, Boiling Springs; in Delaware County, Concordville; in Fayette County, George Township and Republic; in Fulton County, Ayr Township; in Indiana County, South Mahoning Township and Washington Township; in Jefferson County, Cool Spring; in Lancaster County, Florin; in Lebanon County, Annville, Newmanstown and Palmyra; in Luzerne County, Dupont and Pittston Township; in Lycoming County, Loyalsock Township; in Mifflin County, Granville Township; in Montgomery County, Bryn Mawr, Lower Providence Township and Montgomery Township (2); in Northampton County, Palmer Township; in Northumberland County, Mt. Carmel Township; in Schuylkill County, Artz, Porter Township and Sheppton (2); in Somerset County, Milford Township and Quemahoning Township; in Washington County, Carroll Township; in Westmoreland County, East Huntingdon Township and Unity Township; in York County, Penn Township (3); and Spring Garden Township.

Dead Animals. In Adams County, Berwick Township and Orrtanna; in Allegheny County, Patton Township and Plum Township; in Bedford County, Bedford Township and Napier Township; in Blair County, Juniata Township; in Butler County, Slippery Rock Township and Washington Township (2); in Cambria County, Summerhill Township; in Chester County, East Nottingham Township; in Elk County, Fox Township; in Fayette County, Dunbar Township and North Union Township; in Indiana County, Conemaugh Township; in Jefferson County, Winslow Township; in Juniata County, Walker Township; in Lebanon County, Annville; in Lehigh County, Washington Township; in Luzerne County, Hazle Township; in Mercer County, Pine Township and Pymatuning Township; in Mifflin County, Granville Township; in Monroe County, Snyderville and Stroud Township; in Northampton County, Bushkill Township, Lower Saucon Township and Wind Gap; in Pike County, Blooming Grove; in Snyder County, Franklin Township, Penn Township and Union Township; in Somerset County, Addison Township and Husband; in Tioga County, Gaines Township and Lawrence Township.

Swamp Land and Stagnant Water. In Allegheny County, East Deer Township; in Cambria County, Stony Creek Township; in Centre County, Spring Township; in Clarion County, Vowinckel; in Cumberland County, Barnitz; in Dauphin County, Susquehanna Township; in Juniata County, Fermanagh Township; in Lancaster County, Elizabeth Township; in Lebanon County, Myerstown; in Luzerne County, Port Griffith; in Lycoming County, Loyalsock Township; in Pike County, Lackawaxen Township; in Snyder County, Chapman Township and Port Trevorton; in Wayne County, South Canaan.

Sewage Disposal Plants. In Berks County, Reading; in Washington County; Arden; in York County, Penn Township (Borough of Hanover).

10. ORDERS OF ABATEMENT.

To do away with possible causes of disease and mortality in the way of public menaces and nuisances, more especially outside of boroughs and cities and within the watersheds of streams drawn upon for water supplies, the Commissioner of Health has the power and authority to order such nuisances and menaces to be abated and removed. Upon examination made by any persons duly authorized by the Commissioner of Health so to do, information as to the facts is submitted to this office and thereupon an order to abate may be issued. These orders are signed by the Commissioner of Health and served by the field or local health officers. Many hundreds of properties have been put in sanitary condition upon inspection and the verbal request of the field or local health officer, without resort to the issuing of a formal order of abatement.

Nine thousand three hundred and thirty-five written orders have been prepared for issuance during the year. Except for 97 of them, these notices have been made out as the result of inspections by the Department's field officers and have been for the abatement of nuisances polluting or menacing the purity of streams from which public water supplies are drawn. The 97 orders referred to have been for the abatement of unsanitary conditions in general, mostly reported by local health officers. A more detailed statement of these orders of abatement is given elsewhere in this report.

11. DRAFTING.

The work of the drafting room has continued as in preceding years and is carried out as part of the work of the Design and Construction Section of the Engineering Division. It consists chiefly of map tracing and chart making for the various divisions of the Department as well as work on the design and construction of water works, sewerage systems and miscellaneous engineering work at the State sanatoria. As in 1910 the work of compiling township atlases of the various counties in the State was continued, making use of material furnished by Atlases, the U. S. Geological Survey sheets and the reports of the field inspectors. Besides this regular work, county, township, borough and village maps were made for use of the field inspectors and a large number of charts, maps, forms and diagrams were prepared for the Medical Division and the Division of Distribution of Biological Supplies.

The following tabulation shows in detail the distribution of work completed during the year, a summary of which is given herewith.

Total number of week's work done in the drafting room:

Designs and construction,	136
Township maps,	280
Medical Division charts,	130
Total,	546

The number of weeks spent on construction work in the field is 130.

The maps, drawings and sheets made during the year are as follows:

Township maps as in the detailed table following,	634
Special maps for Engineering Division,	82
Special maps or charts for Medical Division,	100
Total,	816

County.	County Maps	Townships.		Boroughs & Villages.	
		New.	Revised.	New.	Revised.
Adams,			2		
Allegheny,					
Armstrong,		3	4		
Beaver,			1		
Bedford,		2			
Bucks,		34		39	14
Butler,			1		
Cambria,		3	1	1	
Carbon,		6	20	19	
Centre,	1				

County.	County Maps	Townships.		Boroughs & Villages.	
		New.	Revised.	New.	Revised.
Chester,		58		8	5
Clarion,		1	1	1	
Clinton,	1	4			
Crawford,		2	1		
Cumberland,				1	
Delaware,		12	18	27	8
Erie,		1			
Fayette,		1			
Fulton,				1	
Greene,		2			
Huntingdon,		1	1		
Indiana,		4			
Jefferson,				1	
Lackawanna,		3	1		
Lancaster,		18			
Lehigh,	1	1		6	
Luzerne,		7	6		
Lycoming,	1	1			
McKean,		5			
Mercer,		1	1		
Monroe,		4			
Montgomery,		35	23	41	19
Northampton,	1	1		13	
Pike,		1			
Schuylkill,		4	4		
Snyder,	1				
Tioga,		1	1		
Union,		1			
Venango,		9			
Washington,		42		62	
Westmoreland,		8			
Total,	6	276	86	220	46
Grand total,					634

III. ENGINEERING.

12. WATER WORKS AND SEWERAGE APPLICATIONS.

The review of plans of proposed sewerage and water works systems, and of extension to existing systems, and the making of investigations and reports in relation thereto has been an important part of the work performed by the Engineering Division.

There were 292 sewerage and water works applications received by the Department and recorded during the year; 117 pertaining to water works and 175 pertaining to sewerage. Of the water works applications, 35 were sent in by municipalties and 82 by private corporations. Of the sewerage applications, 150 were made by municipalities and 25 by private corporations and individuals.

The water works applications may be classified as follows: 55 for ground water sources; 7 for both ground and surface waters, and 55 for surface water sources, in 20 cases of which the plans provided for purification by filtration of the surface waters and in 4 additional instances the surface waters were being filtered at the time the applications for extensions were made, namely, in the following cases:

WATER WORKS APPLICATIONS WHERE SUPPLY WAS BEING FILTERED.

1. Bethlehem City Water Company.
2. Lancaster City.
3. Lancaster Water Filtration Company.
4. York Water Company.

The applications for permits to supply water from new water filter plants are given below:

WATER WORKS APPLICATIONS PERTAINING TO PROPOSED FILTER PLANTS.

1. Berwick Water Company.
2. Bethlehem Steel Company.
3. Clarion Water Company.
4. Dingmans Ferry Water Company.
5. Emporium Water Company.
6. Evitts Creek Water Company.
7. Falls Creek.
8. Haysville Water Company.
9. Huntingdon Reformatory.
10. Latrobe Water Company.
11. Marianna Water Company (First application).
12. Marianna Water Company (Second application).
13. Masontown.
14. Muncy Water Supply Company.
15. Parker City Water Company.
16. Perkasie Water Supply Company.
17. Phoenixville.
18. Quarryville Water Company.
19. South Fork Water Company.
20. State Asylum for Chronic Insane of Pennsylvania. (Wernersville).

The sewerage applications may be classified as follows: 45 for sanitary sewerage systems to take sewage only; 69 for combined systems to receive both sewage and storm water; 48 for sewage disposal works, and 13 for extension of time.

The applications for sewage disposal plants are given below:

APPLICATIONS FOR NEW SEWAGE DISPOSAL PLANTS OR IMPROVEMENTS TO OLD PLANTS.

1. Allegheny County Home & Hospital for Insane, Collier Township.
2. Arnold.
3. Ben Avon Heights Sewer Co., Kilbuck Township, Allegheny County.
4. Bethany Orphans Home, Heidelberg Township, Berks County.
5. Bristol.
6. A. R. Brittan et al., East Stroudsburg.
7. Buck Hill Falls Company.
8. Chambersburg.
9. Collingdale.
10. Danville.
11. Edinboro (First Application).
12. Edinboro (Second Application).
13. Glen Mills School.
14. Good Year Lumber Company, Norwich Township, McKean County.
15. Home and Hospital of Good Shepherd (First application).
16. Home and Hospital of Good Shepherd (Second application).
17. Indiana.
18. Lebanon.
19. Ligonier (First application).
20. Ligonier (Second application).
21. Ligonier (Third applciation).
22. Masontown.
23. Meadville.
24. Middletown Drg Company and Boro.
25. Monessen.
26. Nazareth (First application).
27. Nazareth (Second application).
28. New Kensington.
29. Northwestern Anti-tuberculosis League.
30. Palmer Land Co., Lower Towamensing Township, Carbon County.
31. Pittsburgh-Buffalo Co.
32. Pleasantville.
33. Quakertown.
34. Renovo.
35. Ridgway.
36. Rumpfs Sons, Frederick Middletown Township, Bucks County.
37. Rush Hospital, Willistown Township. Chester Co. (First application).
38. Rush Hospital. Willistown Township. Chester Co. (Second application).
39. St. Francis Industrial School.
40. Schuylkill County Poor Farm. North Manheim Township.
41. South Bethlehem (First application).
42. South Bethlehem (Second application).
43. South Fork.
44. Somerset.
45. Swarthmore.
46. Uniontown.
47. West Chester.
48. Western Pennsylvania Hospital for the Insane (Dixmont).

Of the applications in the foregoing list 20 have not been finally acted upon, most of them pending the submission of more complete and detailed studies or reports of tests being conducted at the suggestion of the Department. These applications are numbered 2, 7, 9, 11, 12, 13, 17, 23, 27, 28, 29, 31, 32, 35, 39, 42, 43, 44, 45, 46, in the above list. Numbers 38 and 48 were taken up in letters addressed to the applicants by the Commissioner of Health discussing the designs submitted. Number 15 is among those dismissed as noted below.

Places making applications for extension of time in which to fulfill the terms of the decrees issued by the Commissioner of Health and to continue the discharge of sewage into the waters of the State, are as follows:

SEWERAGE APPLICATIONS FOR EXTENSION OF TIME.

1. Aliquippa.
2. Ben Avon.
3. Connellsville.
4. Dorranceton.
5. Erie Imp. Company, Mill Creek and Harbor Creek Townships.
6. Grove City (Borough).
7. Kane.
8. Mt. Union.
9. New Castle.
10 South Bethlehem, Armstrong County.
11. South Bethlehem, Northampton County.
12. South Brownsville.
13. South Sharon.

In the applications in the foregoing list numbers 1, 2, 3, 6, 7, 10, 12, 13 have not been definitely acted upon, pending the submission of evidence of progress and good faith on the part of the applicant to comply with the requirements of the decrees of the Department.

Of the 292 applications recorded during the year, 210 have been examined and reported, upon, also 3 applications left over from 1907, 4 from 1908, 14 from 1909, and 25 from 1910, making a total of 256 applications investigated and reported upon during the year.

The applications of the following public and private corporations were dismissed or withdrawn; Lancaster Water Filtration Company received 1907; McKeesport City received 1908; Harrisburg (5 applications), Marianna Water Company, McKeesport City, Ohio Valley Water Company and Punxsutawney Water Company received 1909; Harrisburg (2 applications), Monessen and Nippenose Water Company received 1910; and Harrisburg (3 applications), Haysville Water Company, Home and Hospital of the Good Shepherd and Mt. Union Water Company received 1911, making a total of 21 dismissals.

In 158 cases conclusions have been reached and permit or decree has been duly issued by the Commissioner of Health. Of these 158 cases, 78 obtain to water works and 80 to sewerage and sewage treatment works. A more complete discussion and summary of the water works permits and sewerage permits will be found under these respective heads.

A summary of the water works and sewerage applications received and acted upon since the inauguration of the Department is given below:

SUMMARY OF APPLICATIONS RECEIVED AND ACTED UPON.

Applications received in 1905-06,	155
Applications received in 1907,	236
Applications received in 1908,	306
Applications received in 1909,	324
Applications received in 1910,	286
Applications received in 1911,	292
Total,	1,599

Applications acted upon in 1905-06,	74
Applications acted upon in 1907,	159
Applications acted upon in 1908,	266
Applications acted upon in 1909,	278
Applications acted upon in 1910,	282
Applications acted upon in 1911,	227
Total,	1,286

There were 263 applications pending at the end of 1911, 50 having been either dismissed or withdrawn. Of the 263 applications, 124 are for water works and 139 for sewerage and sewage treatment works. Of these, 64 of the water works and 49 of the sewerage were investigated and reported upon, leaving 150 to be investigated.

The 1,599 applications comprise 571 water works and 1,028 sewerage systems. Of the former 131 were for municipal and 440 for private plants, and of the sewerage 900 were for municipal and 128 for private works.

It may be interesting to note that 184 of the water works applications concerned ground sources, 11 both ground and surface and 376 surface sources; further that in 72 instances the surface waters were being filtered and that in 76 instances filtration was contemplated. The applications as received by years are shown in the following table:

WATER WORKS APPLICATIONS.

Class of Application.	1905-06	1907	1908	1909	1910	1911	Total
Concerning surface sources,	23	47	75	97	79	55	376
Concerning ground and surface sources,	....	....	....	....	4	7	11
Concerning ground sources,	11	24	32	27	35	55	184
Total	34	71	107	124	118	117	571

	1905-06	1907	1908	1909	1910	1911	Total
Where surface waters are being filtered,	1	6	26	23	12	4	72
Where filters were contemplated,	2	11	11	12	20	20	76
Total,	3	17	37	35	32	24	148

So it appears that in 148 instances plans for new water filter plants or plans for extensions to existing plants or the methods of operation have been carefully considered and passed upon, or will engage the attention of the Department at an early date.

On December 31st, 1911, there were 91 filter plants in operation or under construction for the purpose of supplying water to the public in Pennsylvania. These plants are given in the following table arranged alphabetically, according to the name of the water company where the sytem supplies numerous equally important places and according to the name of the place supplied where the district is limited or according to the name of the metropolis where its suburbs are supplied:

WATER FILTER PLANTS IN USE OR BEING ERECTED.

1. Apollo, Apollo Water Works Company.
2. Beaver Creek Water Company Rutherford Heights.
3. Beaver Valley Water Company, East Vale plant.
4. New Brighton plant.
5. Bethlehem City Water Company, South Bethlehem and other towns near Bethlehem.
6. Bristol, Bristol Water Company.
7. Brookville, Municipal plant.
8. Butler, Butler Water Company.
9. Cambridge Springs, Municipal plant.
10. Canton, Citizens Water Company.
11. Carlisle, Carlisle Gas and Water Company.
12. Charleroi, Charleroi Water Company.
13. Chester, New Chester Water Company.
14. Clarion, Clarion Water Company.
15. Columbia, Columbia Water Company.
16. Connellsville, Connellsville Water Company.
17. Danville, Municipal plant.
18. Danville, Plant of the State Hospital for the Insane.
19. Eaglesmere, Eaglesmere Water Company.
20. Elizabeth and neighboring towns, Monongahela Valley Water Company.
21. Ellwood City, Ellwood Water Company.
22. Enola, Dauphin Consolidated Water Company.
23. Ernest, Jefferson and Clearfield Coal and Iron Company.
24. Franklin Municipal plant.
25. Freeport, Freeport Water Works Company.
26. Gettysburg, Gettysburg Water Company.
27. Harrisburg, Municipal plant.
28. Holmesburg, Philadelphia and Bristol Water Company.
29. Hummelstown, Hummelstown Consolidated Water Company.
30. Huntingdon, Huntingdon Water Supply Company.
31. Indiana, Clymer Water Company of Indiana.
32. Iselin, Pittsburgh Gas and Coal Company.
33. Jenkintown and vicinity, Moreland Spring Water Company.
34. Kittanning, Armstrong Water Company.
35. Lancaster, Municipal plant.
36. Lebanon Valley Consolidated Water Company plant at Jonestown.
37. Marianna, Marianna Water Company.
38. McKeesport, Municipal plant.
39. Mechanicsburg, Mechanicsburg Gas and Water Company.
40. Media, Municipal plant.
41. Middletown, Middletown and Swatara Consolidated Water Company
42. Monessen, Monessen Water Company.
43. Monongahela, Monongahela City Water Company.
44. Morganza, Pennsylvania Reform School.
45. Natrona, Natrona Water Company.
46. New Bethlehem, Citizens Water Company.
47. New Castle, City of New Castle Water Company.
48. Newport, Home Water Company.
49. Norristown, Norristown Insurance and Water Company.
50. North East, Municipal plant.
51. Parker, Parker City Water Company.
52. Pennsylvania Water Company, Wilkinsburg and other Pittsburgh suburbs.
53. Perkasie, Perkasie Water Supply Company.
54. Philadelphia Municipal, Belmont plant.
55. Lower Roxboro plant.
56. Queen Lane plant.
57. Torresdale plant.
58. Upper Roxboro plant.

59. Pittsburgh, Municipal plant.
60. Pottstown, Pottstown Gas and Water Company.
61. Punxsutawney, Punxsutawney Water Company.
62. Quarryville, Quarryville Water Company.
63. Reading Municipal, Antictam plant.
64. Bernhart plant.
65. Egelman plant.
66. Maiden Creek plant.
67. Ridgway, Municipal plant.
68. Riverton Consolidated Water Company, Lemoyne and other suburbs of Harrisburg.
69. Royersford and Spring City, Home Water Company.
70. St. Benedict, St. Benedict Water Company.
71. Sayre and Athens, Sayre Water Company.
72. Scranton, Scranton Gas and Water Company.
73. Sharon and South Sharon, Sharon Water Works Company.
74. South Pittsburgh, South Pittsburgh Water Company.
75. Springfield Consolidated Water Company, Neshaminy Creek plant, Springfield Water Company.
76. Crum Creek plant.
77. Pickering Creek mechanical plant.
78. Pickering Creek slow sand plant.
79. Spring Grove, P. H. Gladfelter Company.
80 Steelton, Municipal plant.
81. Sunbury, Sunbury Water Company.
82. Tarentum and Brackenridge, Allegheny Valley Water Company.
83. Vandergrift and neighboring boroughs, Vandergrift Water Company.
84. Washington, Citizens Water Company.
85. Warren, Warren Water Company.
86. Waynesburg, Waynesburg Water Company.
87. West Pittsburgh, West Pittsburgh Water Company.
88. West Reading, West Reading Water Company.
89. Wilkes-Barre, Spring Brook Water Supply Company.
    Crystal Lake plant.
90. Toby Creek plant.
91. York and vicinity, York Water Company

With respect to the sewerage applications received since the inauguration of the Department 333 relate to sanitary sewers, 473 to combined sewers, 183 to sewage treatment works and 39 have been for extensions of time. The applications as received by years are shown in the following table:

SEWERAGE AND SEWAGE TREATMENT APPLICATIONS.

Class of Application.	1905-06	1907	1908	1909	1910	1911	Total
Sanitary sewers,	39	68	81	48	52	45	333
Combined sewers,	68	71	82	112	71	69	473
Treatment works,	14	26	33	29	33	48	183
Extension of time,	....	....	3	11	12	13	39
Total,	121	165	199	200	168	175	1,028

So it appears that in 183 instances plans for sewage treatment plants have been examined and passed upon or will engage the attention of the Department at an early date.

On December 31st, 1911, there were at least 65 sewage treatment plants, big and little, in operation or building in Pennsylvania. The following table is the list of these plants. There are many more treatment plants for smaller enterprises, private estates and individual plants:

SEWAGE DISPOSAL PLANTS IN USE OR BEING ERECTED.

Cities.

1. Altoona, Blair County.
2. Philadelphia (Pennypack District).
3. Reading, Berks County.

Boroughs.

4. Chambersburg, Franklin County.
5. Derry, Westmoreland County.
6. Dormont, Allegheny County.
7. Indiana, Indiana County.
8. New Wilmington, Lawrence County.
9. Washington, Washington County.
10. West Chester, Chester County (2 plants).

State Institutions.

11. Chester Springs Soldiers' Orphans' School, Chester County.
12. Eastern Pennsylvania State Institution for the Feeble Minded and Epileptic, near Spring City, Chester County.
13. Homeopathic State Hospital for the Insane, near Allentown, Lehigh County.
14. Pennsylvania Industrial Reformatory, near Huntingdon, Huntingdon County.
15. Pennsylvania Reform School, Morganza, Washington County.
16. Pennsylvania Soldiers' Orphans' Industrial School, Scotland, Franklin County.
17. Pennsylvania State Lunatic Hospital, near Harrisburg, Dauphin County.
18. Pennsylvania State South Mountain Sanatorium, Mont Alto, Franklin County.
19. State Asylum for the Chronic Insane of Pennsylvania, South Mountain, Wernersville, P. O., Berks County.
20. State Hospital for the Insane at Danville, Montour County.
21. State Hospital for the Insane of the Southeastern District, Norristown, Montgomery County.
22. Sate Institution for Feeble Minded of Western Pennsylvania Polk, Venango County.

County Institutions.

23. Allegheny County Work House, O'Hara Township, Allegheny County.
24. Lehigh County Home and Almshouse near Allentown, Lehigh County.
25. Montgomery County Home for the Poor, Upper Providence Township, Montgomery County.
26. Schuylkill County Home and Hospital, near Schuylkill Haven, Schuylkill County.
27. Somerset County Home and Hospital, Somerset, Somerset County.

City Institutions.

28. Allegheny City Home, O'Hara Township, Allegheny County.
29. Pittsburgh Water Works Department, Sewerage at Filter Plant near Aspinwall, Allegheny County.

Drainage Corporations.

30. Devon Drainage Company, Devon, Chester County.
31. Doylestown Sewerage Company, Doylestown, Bucks County.
32. Hanover Sewer Company, Hanover, York County.
33. Wayne Sewerage Company, Wayne, Delaware County.

Land Improvement Companies.

34. Enola Realty Company, Enola, Cumberland County.
35. Palmer Land Company, Palmerton, Carbon County.

Associations and Private Systems for Boroughs and Villages.

36. A. R. Brittain et al., East Stroudsburg, Monroe County.
37. Bryn Athyn Village Association, Bryn Athyn, Montgomery County.
38. Cressman, Philip, for Perkasie, Bucks County.
39. Mt. Gretna Park, Lebanon County.
40. South Wayne Plant, Wayne, Delaware County.
41. Valley Camp Association, Lower Burrell Township, Westmoreland County.

Private Institutions.

42. Dermady Sanatorium, Morton, Delaware County.
43. Free Hospital for Poor Consumptives, White Haven, Luzerne County.
44. Haverford College, Haverford, Delaware County.
45. Home and Hospital of the Good Shepherd, Radnor Township, Delaware County.

46. House of Refuge, Darlington, Middletown Township, Delaware County, Girls' Department.
47. House of Refuge, Glen Mills, Thornbury Township, Delaware County, Boys' Department.
48. Northwestern Anti Tuberculosis League, Belle Camp, Foster Township, McKean County.
49. Perkiomen Seminary, Pennsburg, Montgomery County.
50. Philadelphia Jewish Sanatorium for Consumptives, Eagleville, Montgomery County.
51. Rush Hospital, Country Branch, Willistown Township, Chester County, near Malvern.
52. Tressler Orphan Home, Loysville, Perry County.
53. Villanova College, Villanova, Delaware County.
54. Western Pennsylvania Hospital for the Insane, Dixmont, Allegheny County.
55. Williamson Free School of Mechanical Trades, Middletown Township, Delaware County.

Industrial Corporations.

56. Allan Wood Iron and Steel Co., Ivy Rock Station, near Conshohocken, Montgomery County.
57. Elk Tanning Company, Tannery at Stoneham, Warren County.
58. Howard Tannery, Columbus Township, Warren County, near Corry.
59. Morrisville Rubber Works, Morrisville, Bucks County.
60. Nelson Valve Company, Springfield Township, Montgomery County, near Chestnut Hill.
61. New Jersey Zinc Company, Palmerton, Carbon County.
62. Pennsylvania Glue Company, Springdale, Allegheny County.

Miscellaneous.

63. Parkside Hotel, Willow Grove, Montgomery County.
64. Warren Water Company, sewerage at filter plant, near Warren, Warren County.
65. Willow Grove Park, Montgomery County.

WATER WORKS.

13. WATER WORKS PERMITS AND DECREES ISSUED BY THE COMMISSIONER OF HEALTH UP TO JANUARY 1ST, 1912.

This work has been done under Act 182, approved April 22, 1905. The law is entitled, "An Act to preserve the purity of the waters of the State for the protection of the public health." The term, "Waters of the State," is defined to include all streams and springs, and all bodies of surface and of ground water, whether natural or artificial, within the boundaries of the State.

Acting under this law, which prescribes that no water works for the supply of water to the public shall be constructed or extended, or an additional source of supply be secured, without a written permit, to be obtained from the Commissioner of Health, the scope of inquiry in each case has been strictly confined to whether the supply be prejudicial to public health.

The virgin waters of the State are pure. They often gather in their devious courses, on or below the surface of the ground, foreign matter of a poisonous character. To preserve their purity absolutely is impossible, but approximations may be achieved. The results frequently concern the removal of impurities injurious to public health under conditions demanding continual supervision by the State.

Precedent to judgment in any particular case, the full information as to the source of supply and capacity, the manner of collection and the means of distribution is indispensable; with respect to the source, principally as to danger to be guarded against and means necessary for protection; with respect to capacity, because, besides other reasons, where a supply be altogether good and limited, consumers may be compelled by shortage to have frequent recourse to private wells and neighborhood springs in close proximity to and polluted by cesspool or privy drainage, or other sewage contamination, or because recourse may be frequently had to a polluted stream as the supplementary supply, and thus spread disease in the town, conditions which the law does not contemplate the State authorities should overlook or sanction; with respect to details, because, besides other reasons, the interests of the public health require that ample facilities for quick drainage or shutting off of any infection in any part of the system shall be provided, or where a filter may amply purify water in ordinary times, during a fire the speeding up may be at a rate entirely beyond the purifying capacity and thus sewage water be introduced into town, or direct recourse may be had to raw creek water for emergencies.

In connection with the subject, it may be important to know about the private wells and springs in the town.

For the dissemination of the information gathered by the Department, the permits or decrees to the local authorities or water company officials set forth quite fully the local conditions under which an additional source of supply or an extension to existing water works will not be prejudicial to public health. The stipulations in the decree refer to provisions for removal of sources of pollution, or to protective measures, such as sanitary patrol of watersheds and the reporting thereof, efficient operation of purification works, and to other safeguards necessary or that may be required by the Commissioner of Health in case the water works system or any part thereof, or the water supplied thereby becomes prejudicial to public health at any time.

With respect to the 78 water works permits and decrees issued during the year, 28 embraced surface sources, 27 ground sources and 23 a combination of the two. Complete purification is required of the surface waters in 21 cases and of the ground water in one case. Chemical disinfection is required in 27 cases for use in connection with emergency or auxiliary sources, or to meet special conditions, or as a temporary safeguard pending the installation of complete purification plants. The 22 cases where complete purification is required or approved are as follows:

WATER WORKS PERMITS AND DECREES APPROVING OR REQUIRING FILTRATION.

1. Bath Borough.
2. Berwick Water Company.
3. Clarion Water Company, (Well water).
4. Dickerson Run Water Company (Provisional).
5. Haysville Water Company.
6. Lancaster City.
7. Marianna Water Company.
8. Masontown Borough.
9. Muncy Water Supply Company.
10. Norristown Insurance and Water Company.
11. Panther Valley Water Company, (Provisional).
12. Parker City Water Company.
13. Perkasie Water Supply Company.
14. Perkasie Water Supply Company, (Second permit).
15. Phoenixville Borough, (Decree).
16. Phoenixville Borough, (Permit).
17. Quarryville Water Company.
18. South Fork Water Company.
19. State Asylum for Chronic Insane of Pennsylvania. (Wernersville).
20. Suburban Water Company, of Allegheny County, Pa.
21. Vesta Coal Company, (Provisional).
22. York Water Company.

The applications for Nos. 10 and 20 in the foregoing table were received in 1910. Nos. 1, 4, 11, 13, 15, 16 and 21 are permits or decrees requiring the preparation of filtration plans for sources proposed by the applicants to be used unfiltered or to make safe existing sources.

The 27 cases where chemical disinfection is required are as follows:

WATER WORKS PERMITS AND DECREES APPROVING OR REQUIRING CHEMICAL DISINFECTION.

1. Austin Borough (Temporary).
2. Bath Borough (Pending filtration).
3. Edinboro Borough (Emergency).
4. Emaus Borough (Emergency).
5. Emaus Borough (Emergency) (Second permit).
6. Greencastle Borough (With large storage reservoir).
7. Haysville Water Company (Pending filtration).
8. Hyndman Water Company (Auxiliary).
9. Jersey Shore W. Company (Auxiliary and temporary).
10. Jersey Shore W. Company (Auxiliary and temporary) (Second permit).
11. Lancaster City (Emergency, with filtration).
12. Marianna Water Company (Pending filtration).
13. Muncy Water Supply Company (Pending filtration).
14. Nippenose Water Company (Temporary).
15. Norristown Insurance and Water Company (With filtration).
16. North Manheim Water Company (for coal storage yards).
17. Ohio Valley Water Company (Emergency).
18. Parker City Water Company (Pending filtration).
19. Perkasie Water Supply Company (Pending filtration).
20. Perkasie Water Supply Company (Pending filtration) (Second permit).
21. Phoenixville Borough (Pending filtration) (Decree).
22. Phoenixville Borough (Pending filtration) (Permit).
23. Quarryville Water Company (Pending filtration).
24. Salladasburg Water Company (Temporary).
25. Shrewsbury Borough (For water to drive ram).
26. Suburban Water Company of Allegheny County, Pa. (Pending filtration).
27. York Water Company (with filtration).

The application for No. 15 in the foregoing table was received at the close of 1910. Nos. 11, 12, 18, 23, 26 and 27 are permits or decrees relative to chemical disinfecting plants previously installed in emergencies. Nos. 1, 2, 3, 4, 7, 8, 9, 13, 14, 16, 19, 21, 24 and 25 are permits or decrees requiring the installation of chemical disinfecting plants for sources proposed by the applicants, or as safeguards in connection with existing sources.

There have been 385 water works permits or decrees issued since the creation of the State Department of Health.

WATER WORKS PERMITS AND DECREES ISSUED.

Water works permits and decrees issued 1905-06,	23
Water works permits and decrees issued 1907,	25
Water works permits and decrees issued 1908,	72
Water works permits and decrees issued 1909,	84
Water works permits and decrees issued 1910,	103
Water works permits and decrees issued 1911,	78
Total,	385

In some instances several permits were issued to the same party. The 385 permits or decrees involve 286 owners of water works systems, as follows:

Municipal water works systems,	59
Water works corporations,	193
State Institutions,	5
County Institutes,	2
Associations and private citizens,	22
Industrial works,	5
	286

There are 407 cities, boroughs and townships in Pennsylvania now being supplied with water by water works systems that have been examined and made the subjects of decrees by the Department. A water company may supply several towns and in a number of municipalities more than one water company are operating, as will appear in the detailed statement that follows:

In the first column of the following table are entered alphabetically, with consecutive numbers, the cities, boroughs, and townships comprising the charter territories and water supply districts of the water works systems covered by the permits and decrees of the State Department of Health. To indicate cases of municipal ownership consecutive numbers are entered in the second column opposite the names of municipal owners. In cases of private ownership the names of the municipalities are followed by the names of the water works owners in parenthesis, except that where the names of municipalities begin the titles of the water works owners, the latter are omitted in the first column and entered opposite the former, in the third and fourth columns.

The third and fourth columns contain respectively the names of private water works corporations and unincorporated private owners arranged alphabetically, with consecutive numbers, and followed by the names of the municipalities comprising the charter territories and water supply districts, except where these latter are shown immediately opposite in the first column. The number of permits and decrees issued are entered in the last three columns opposite the name of water works owner where it appears in alphabetical order.

WATER WORKS PERMITS AND DECREES ISSUED BY THE COMMISSIONER OF HEALTH—Continued.

Place.	Owner of Water Works.					
	Municipal.	Water Company.	Miscellaneous.	1905-10	1911	Total.
1 Abington Township (Springfield Cons. W. Co.), (Weldon W. Co.),						
2 Akron,	1			....	1	1
3 Albion (see also Albion W. Co.),	2			1	....	1
		1 Albion Water Co., (Albion),		1	....	1
4 Aldan (Springfield W. Co.)						
5 Aleppo Twp. Allegheny Co., (Haysville W. Co.)						
		2 Allison Park Water Co., (Hampton Township),		....	1	1
			1 Alwine, Jerry, (Johnstown),	1	....	1
Annville Vil. (N. & S. Annville Twps.)		3 Annville Water Co.,		6	....	6
6 Arendtsville.		4 Arendtsville Water Co.,		1	....	1
7 Athens (Fairview W. Co.)						
8 Austin,	3			1	2	3
9 Avalon (Ohio Val. W. C.)						
10 Avonmore,	4			1	....	1
11 Baden,	5			1	....	1
		5 Bald Eagle Water Co., Tyrone,		1	....	1
12 Barnesboro.	....	6 Barnesboro Water Co., (One of two companies for Barnesboro and Spangler),		1	....	1
13 Bath,	6			....	1	1
		7 Beaver Creek Water Co., (Swatara Township),		1	....	1
14 Bellevue (Ohio Val. W. Co.)						
15 Ben Avon (Ohio Val. W. Co.)						
16 Bensalem Twp. (Trevose Manor Spr. W. Co.)						
		8 Bens Creek Water Co., (Portage Township),		1	....	1
17 Berwick,	....	9 Berwick Water Co.,		2	1	3
18 Bethlehem,	7			2	....	2
19 Big Beaver Township, Beaver Co. (Koppel W. Co.)						
20 Bigler Twp., Clearfield Co., (Ramey W. Co.) (Madera W. Co.)						
21 Biglerville,	....	10 Biglerville Water Co.,		1	....	1
22 Big Run (Punxsutawney W. Co.)						

23 Black Lick Twp. (Marie W. Co. (Nant-y-Glo W. Co. Unine.)						
		11 Blackwood Water Co., (Reilly Township),	....	1	....	1
		12 Blandburg Water Co., (Reade Township),	....	1	....	1
		13 Bloomfield Water and Sewer Company,	....	1	....	1
24 Blossburg,	....	14 Blossburg Water Co.,	....	1	....	1
		15 Blue Ridge Water Supply Co., (Washington Township),	....	1	....	1
Boalsburg, town of, Harris, Twp. Centre Co.,	....	16 Boalsburg Water Co.,	....	1	....	1
			2 Boyer, J .Calvin, (Monroe Township),	1	....	1
			3 Boyer, J. Calvin, (Perry Township),	1	....	1
25 Brackenridge (Tarentum W. Co.)						
26 Braddock Twp. (Penna. W. Co.)						
27 Bradford City,	8	....	....	3	....	3
28 Bradford Twp. (S. Bradford W. Co.)	....	17 Bradford County Water Co., (Sayre),	....	1	....	1
29 Briar Cr. Twp.,	....	18 Briar Creek Water Supply Co.,	....	1	....	1
			4 Brickel, B. W., (Dallas),	1	....	1
30 Bridgeport (Norristown Ins. & W. Co.)						
31 Bridgeton Twp. (Raymond D. Stone)	....	19 Bright Run Water Co., (Butler Township),	....	1	....	1
32 Brisbin (W. Houtzdale W. Co.)						
33 Bristol (see also Bristol W. Co.),	9	....	....	1	....	1
		20 Bristol Water Co., (Bristol),	....	2	....	2
34 Brockwayville,	....	21 Brockway Crystal Water Co.,	....	1	....	1
35 Brookville,	....	22 Brookville Water Co., (Also supplies Rose Township),	....	2	....	2
			5 Bucher, J. C., (S. Middleton Township),	1	....	1
36 Burrell Twp. (Josephine W. Co.)						
37 Butler,	....	23 Butler Water Co.,	....	1	....	1
38 Butler Twp. (Bright Run W. Co.)						
39 Cambria Twp. Cambria Co. (Ebensburg Coal Co.)						
40 Cambridge Springs,	10	....	....	2	....	2
41 Camp Hill (Riverton Cons. W. Co.)						
42 Carrol Twp. (Donora W. Co.)						
43 Cass Twp. (Minersville W. Co.)						
44 Catasauqua,	11	....	....	2	....	2
45 Catawissa,	....	24 Catawissa Water Co.,	....	1	....	1
46 Cecil Twp. (Penna. Reform Schl.)						
47 Chambersburg,	12	....	....	1	1	2
48 Chapman Twp. (Absalom Farwell)						
49 Charleroi,	....	25 Charleroi Water Co., (Fallowfield Township and N. Charleroi B.)	....	1	....	1
50 Cheltenham Twp. (Ogontz W. Co.) (Springfield Cons. W. Co.)						
51 Chester City (New Chester W. Co.)						
53 Chester Twp. (Edgemont W. Co.)						
53 Cheswick (Tarentum W. Co.)						

WATER WORKS PERMITS AND DECREES ISSUED BY THE COMMISSIONER OF HEALTH—Continued.

Place.	Owner of Water Works.			1905-10	1911	Total.
	Municipal.	Water Company.	Miscellaneous.			
		26 Chichester Water Co., (Marcus Hook),	....	2	....	2
54 Christiana,	....	27 Christiana Gravity Water Co.,	....	....	1	1
		28 Citizens Water and Gas Co., of Williamsport,	....	1	....	1
		29 Citizens Water Company of Gordon,	....	1	....	1
		30 Citizens Water Company, of Kittanning, (also supplies Rayburn Township and Wickboro),	....	1	....	1
		31 Citizens Water Company of New Bethlehem, (supplies South Bethlehem, Armstrong County and New Bethlehem, Clarion County),	....	1	....	1
55 Clarion,	....	32 Clarion Water Co.,	....	3	1	4
56 Clearfield,	....	33 Clearfield Water Co.,	....	1	....	1
57 Clifton Heights (Springfield W. Co.)						
		34 Clymer Water Co. of Indiana,	....	3	....	3
58 Coaldale (Panther Val. W. Co.)						
59 College Twp. (University W. Co.)						
60 Collingdale (Springfield W. Co.)						
61 Colwyn, (Springfield W. Co.)						
62 Conneaut Lake,	13	....	....	....	1	1
63 Conneautville,	14	....	....	1	1	2
64 Conshohocken, (Springfield Cons. W. Co.)						
65 Conway,	15	....	....	1	....	1
66 Conyngham Twp. (Glen Brook W. Co.)						
67 Coopersburg,	16	....	....	....	1	1
68 Cressona (Schuylkill Haven G. & W. Co.)						
69 Cresson (see also Cresson W. Co.),	17	....	....	1	....	1
70 Cresson Twp.,	....	35 Cresson Water Company, (also supplies Cresson and Sankertown),	....	1	....	1
			6 Crosby, Gas Co., (Norwich Township),	1	....	1
			7 Curtis (J. G.) Leather Co., (Hamilton Township, McKean Co.),	1	....	1
71 Dale (Johnstown W. Co.)						
72 Dallas (see also B. W. Brickel),	....	36 Dallas Water Company,	....	1	....	1
Danville (see State Hospital.)						

73 Darby (Springfield W. Co.)						
74 Darby Twp. (Springfield Water Co.)						
75 Dauphin,	....	37 Dauphin Consolidated Water Supply Company, (also supplies East Pennsboro Township, Cumberland County, Middle Paxton and Susquehanna Townships, Dauphin County),	....	2	....	2
76 Delano Twp. Schuylkill Co. (Mahanoy City W. Co.)						
77 Delaware Twp. (Dingmans Ferry W. Co.)						
78 Denver,	18	....	....	1	....	1
79 Derry Twp (M. S. Hershey)						
		38 Diamond Water Company* of Hazleton, (Hazleton and W. Hazleton),	....	1	....	1
		39 Dickerson Run Water Company, (New Dickerson Run village, Dunbar and Franklin Townships, Fayette County,)	....	....	1	1
80 Dickson City (Boro.) (Scranton G. & W. Co.)						
81 Dillsburg,	....	40 Dillsburg Water Co.,	....	1	....	1
		41 Dingman's Ferry Water Company (Delaware Township),	....	1	....	1
82 Donora,	....	42 Donora Water Company, (also supplies Carroll Township),	....	1	....	1
83 Dover,	19	....	....	1	....	1
84 Doylestown,	20	....	....	1	....	1
85 DuBois (see also John E. DuBois),	21	....	....	1	....	1
			8 Dubois, John E., (DuBois),	1	....	1
86 Dunbar Twp. Fayette Co. (Dickerson Run W. Co.)						
87 Duncannon (Trout Run W. C.)						
88 Eagles Mere,	....	43 Eagles Mere Water Co.,	....	1	....	1
89 East Bethlehem Twp. Washington Co. (Vesta Coal Co.)						
90 East Brady,	....	44 East Brady Water Works Co.,	....	1	....	1
91 East Deer Twp. (Tarentum W. Co.)						
			9 Eastern Penna. State Inst. for the Feeble Minded and Epileptic, (East Vincent Township, near Spring City,	1	....	1
92 East McKeesport,	....	45 East McKeesport Water Company, (also supplies N. Versailles Township, and Wall and Wilmerding boroughs),	....	1	....	1
		46 Eastmere Water Company, (for E. End village, Swatara Township, Dauphin County), (Sold to Harrisburg),	....	1	....	1
93 Easton City (S. Easton W. Co.) (Lehigh W. Co.)						
94 E. Pennsboro Twp. (Dauphin Cons. W. S. Co.) (Riverton Cons. W. Co.) (H. M. Horner)						
95 East Pittsburgh (Penna. W. Co.)						
96 Easttown Twp. (Springfield Cons. W. Co.)						

WATER WORKS PERMITS AND DECREES ISSUED BY THE COMMISSIONER OF HEALTH—Continued.

Place.	Owner of Water Works.			1905-10	1911	Total.
	Municipal.	Water Company.	Miscellaneous.			
97 E. Union Twp. Schuylkill Co. (Mahanoy City W. Co.						
98 East Vincent Twp. (Eastern Penna. State Inst. near Spring City)						
			10 Ebensburg Coal Co., (Cambria Township, Cambria Co.), ..	....	1	1
99 Edinboro,	22	....	....	1	1	2
100 Eddystone (Ridley W. Co.) (Springfield W. Co.)						
		17 Edgemont Water Company, (Chester Township),	....	2	....	2
101 Edgewood (Penna. W. Co.)						
102 Eldred (Galeton-Eldred W. Co.)						
103 Ellwood City (Boro),	....	48 Ellwood Water Co.,	....	2	....	2
104 Emaus (see also Mountain W. Co.),	23	....	....	....	2	2
105 Emlenton,	....	49 Emlenton Water Co.,	....	1	....	1
106 Emporium,	....	50 Emporium Water Co.,	....	2	....	2
107 Emsworth (Ohio Val. W. Co.)						
Enola Vil. E. Pennsboro Twp. (Dauphin Cons. W. S. Co.)						
108 Ephrata,	21	....	....	....	1	1
		51 Extension Water Co. of Penbrook,	....	1	....	1
109 Fairchance,	25	....	....	1	....	1
110 Fairview Twp. York Co. (Riverton Cons. W. Co.)	....					
		52 Fairview Water Co., (Athens),	....	1	....	1
111 Fallowfield Twp. (Charleroi W. Co.)						
112 Falls Creek,	26	....	....	1	....	1
			11 Farwell, Absalom, (Chapman Township),	1	....	1
113 Ferguson Twp. (University W. Co.)						
114 Ferndale (Johnstown W. Co.)						
Foxburg, town of (Richland twp. Clarion Co.,	....	53 Foxburg Water Works Co.,	....	1	....	1
Foxburg, town of (Richland twp. Clarion Co.,	....					
116 Franklin City (Venango W. Co., purchased by city)						
117 Franklin Twp. Fayette Co. (Dickerson Run W. Co.)						
118 Freeport,	....	54 Freeport Water Works Co.,	....	1	....	1
119 Galeton,	....	55 Galeton-Eldred Water Company, (also supplies Eldred),	....	1	....	1
120 Gilberton,	....	56 Gilberton-Schuylkill Water Co.,	....	1	....	1
121 Girardville,	....	57 Girardville Water Co.,	....	1	....	1
		58 Gladehurst Water Co., (Somerset Township, Somerset Co.),	....	1	....	1

		59 Glen Brook Water Co., (Conyngham Township),		1	....	1
122 Glenfield Twp. Allegheny Co. (Haysville W. Co.)						
123 Glenolden (Springfield W. Co.)						
124 Glen Rock,	27			1	1	2
125 Gordon (Citizens W. Co. of Gordon)	....					
		60 Gravel Hill Water Supply Co., (N. Londonderry Township),		1	....	1
126 Great Bend (Hallstead W. Co.)						
127 Greencastle,	28			1	1	2
128 Greensburg (part) (Westmoreland W. Co. of Hempfield Twp.)						
129 Hallam (Hellam W. Co.)						
130 Hallstead,	....	61 Hallstead Water Co., (also supplies Great Bend),		1	....	1
131 Hamilton Twp. McKean Co. (J. G. Curtis Leather Co.)						
132 Hamilton Twp. Monroe Co., (Saylorsburg vil.)	....	62 Hamilton Water Co.,		1	....	1
133 Hampton Township, Allegheny County (Allison Park Water Company), (John F. Wyland)						
134 Hanover,	....	63 Hanover and McSherrystown Water Company, (also supplies McSherrystown borough, Adams County and Penn Township, York County),		1	....	1
135 Harmer Township, Allegheny County, (Tarentum Water Co.)						
136 Harrisburg (bought Eastmere Water Co.),	29			1	....	1
137 Harrison Township, Allegheny Co., (Tarentum Water Co.), (Natrona Water Co.)						
138 Harris Township, Centre Co., (Boalsburg Water Co.) (State College Water Co.)						
139 Haverford Township, (Springfield Water Co.)						
140 Haysville,	....	64 Haysville Water Co., (Inc. Jan. 28, 1898 for Aleppo Township, Allegheny County and Osborne also supplies Haysville from Aleppo 1902 and Glenfield June 10, 1876),		....	1	1
141 Hazleton City (see also Diamond Water Co. of Hazleton),	....	65 Hazleton Water Co.,		1	....	1
142 Hazle Township, (Milnesville Water Co.)						
143 Heidelberg Twp., Lebanon County,	....		12 Heidelberg Water Co., (of Schaefferstown village),	1	....	1
144 Hellam Township (see also York Water Co.),	....	66 Hellam Water Co., (Inc. Oct. 11, 1906), (also supplies Hallam, Inc. May 25, 1908),		1	....	1
145 Hempfield Township (Westmoreland Water Co. of Hempfield Township),						
			13 Hershey, M. S., (Derry Township),	1	....	1
146 Hilltown Township, Bucks County,	....	67 Hilltown Water Co.,		....	1	1
147 Honesdale,	....	68 Honesdale Consolidated Water Company,		1	....	1
			14 Horner, H. M., (E. Pennsboro Township),	1	....	1

WATER WORKS PERMITS AND DECREES ISSUED BY THE COMMISSIONER OF HEALTH—Continued.

Place.	Owner of Water Works.			1905-10	1911	Total.
	Municipal.	Water Company.	Miscellaneous.			
148 Houtzdale,	....	69 Houtzdale Water Co.,	....	1	....	1
149 Hummelstown,	....	70 Hummelstown Consolidated Water Co.,	....	3	....	3
150 Huntingdon (see Penna. Ind. Ref.),	....	71 Huntingdon Water Supply Co.,	....	2	....	2
151 Hyndman,	....	72 Hyndman Water Co.,	....	....	1	1
152 Indiana (Clymer W. Co. of Indiana),						
153 Irwin (Westmoreland Water Co. of Hempfield Twp.),						
		73 Jacks Mountain Water Co., (Mapleton),	....	1	....	1
154 Jackson Township, Cambria County (Nant-y-Glo Water Co., unine.)						
155 Jackson Township, Lebanon Co., (Myerstown Water Company.)						
156 Jeannette (Westmoreland Water Co. of Hempfield Township.)						
157 Jenkintown,	....	74 Jenkintown Water Co.,	....	1	....	1
158 Jersey Shore,	....	75 Jersey Shore Water Co.,	....	....	2	2
159 Johnsonburg (W. E. Zierden)						
160 Johnstown City (see also Jerry Alwine and Morrellville and Cambria Borough Water Co.),	....	76 Johnstown Water Co., (also supplies Dale, Ferndale and Westmont boroughs, and Stony Creek Township),	....	1	....	1
			15 Jones and Laughlin Steel Company, (Woodlawn),	1	....	1
		77 Josephine Water Co., (Burrell Township),	....	1	....	1
161 Juniata,	30	....	....	1	1	2
162 Kingston Township (Shaver Bros., Water Works)						
163 Kittanning (Citizens Water Co. of Kittanning)						
164 Knoxville,	31	....	....	1	....	1
Koppel, town of, Big Beaver Township, Beaver Co.,		78 Koppel Water Co.,	....	....	1	1
Kulpmount, town of, Mt. Carmel Township, Northumberland County,	....	79 Kulpmont Water Co.,	....	....	1	1
165 Lancaster,	32	....	....	....	1	1
166 Lansdale,	....	80 Lansdale Water Co.,	....	....	1	1
167 Lansdowne (Springfield Water Co.)						
168 Lansford, (Panther Valley Water Co.)						
169 Laporte, (Mokoma Spring Water Co.)						
170 Latrobe,	....	81 Latrobe Water Co.,	....	1	....	1

171 Lebanon City,	33	....	....	4	....	4
		82 Lebanon Valley Consolidated Water Supply Company, (N. Lebanon and S. Lebanon Townships),	....	3	....	3
		83 Lehigh Water Co., (Easton),	....	1	....	1
172 Lemoyne (Riverton Cons. Water Co.)						
173 Ligonier,	34	....	....	....	1	1
174 Lock Haven,	35	....	....	....	1	1
175 Logan Township (Roselawn W. Co.),	....					
		84 Londonderry Water Company, (Palmyra, town of, N. Londonderry Township, Lebanon Co.).	....	1	....	1
176 Lower Allen Township, (Riverton Cons. Water Co.)						
177 Lower Chichester Township, (see New Chester Water Company.)						
178 Lower Heidelberg Township, Berks County, (State Asylum for Chronic Insane of Penna.)						
179 Lower Merion Township, (Springfield Water Co.)						
			16 Luzerne Co. Central Poor District Hospital for Insane and Almshouse, (At Retreat Newport Township),	2	....	2
180 McKeesport City,	36	....	....	2	....	2
181 McKees Rocks (Ohio Valley Water Co.)						
182 McSherrystown (Hanover and McSherrystown Water Company.)						
183 Macungie,	37	....	....	1	....	1
Madera Village, Bigler Township, Clearfield Co.,	....	85 Madera Water Co.,	....	1	....	1
184 Mahanoy City (Borough),	....	86 Mahanoy City Water Company, (see also Mahanoy, Delano, and E. Union Townships, Schuylkill Co.),	....	1	1	2
185 Mahanoy Township, Schuylkill County, (Mahanoy City Water Company.)						
186 Mahoning Township, (State Hospital for the Insane, near Danville.)						
187 Manchester Township (York Water Co.)						
188 Manor (Westmoreland Water Co. of Hempfield Township.)						
189 Mapleton (Jacks Mountain W. Co.)						
190 Marcus Hook (Chichester Water Co.)						
191 Marianna (Inc. in 1910),	....	87 Marianna Water Co., (West Bethlehem Township),	....	1	1	2
		88 Marie Water Co., (Black Lick Township),	....	1	....	1
192 Marietta,	....	89 Marietta Gravity Water Co.,	....	1	....	1
193 Marion Center (J. H Rochester of Marion Center Water Co. uninc.)						
194 Marple Township, (Springfield Water Co.)						
195 Mars,	38	....	....	1	....	1
		90 Martindale Water Co., (Portage Borough and Portage Township)	....	1	....	1
196 Masontown,	39	....	....	1	1	2

WATER WORKS PERMITS AND DECREES ISSUE D BY THE COMMISSIONER OF HEALTH—Continued.

Place.	Owner of Water Works.			1905-10	1911	Total.
	Municipal.	Water Company.	Miscellaneous.			
197 Matamoras (Inc. 1905), ...	....	91 Matamoras Citizens Water Company, (Inc. June 17, 1903 for Westfall Township, Pike Co.).	....	1	....	1
198 Mauch Chunk (U. Mauch Chunk Water Co.)						
199 Mauch Chunk Township, (Panther Valley Water Co.)		Mauch Chunk Township Water Company, (Permit 1906. Sold to Panther Valley Water Co., in 1907, which see)				
200 Mechanicsburg, ...	....	92 Mechanicsburg Gas and Water Company, ...	....	2	....	2
201 Meyersdale (Sand Spring Water Co. of Myersdale)						
202 Middle Paxton Township, (Dauphin Cons. Water Supply Co.)						
203 Middletown, ...	....	93 Middletown and Swatara Cons. Water Co., (also supplies Royalton), ...	....	1	....	1
204 Milford Township, (Port Royal Water Supply Co.)						
205 Millersburg, ...	....	94 Millersburg Home Water Co., ...	....	1	....	1
Milnesville Village, Hazle Township, Luzerne Co., ...	....	95 Milnesville Water Co., ...	....	1	....	1
206 Minersville, ...	....	96 Minersville Water Co., (also supplies Cass and New Castle Townships), ...	....	1	....	1
		97 Mokoma Spring Water Co., (Laporte), ...	....	1	....	1
207 Monessen, ...	....	98 Monessen Water Co., (also supplies Rostraver Township), ...	....	1	....	1
208 Monroe (Towanda Water Co.)						
209 Monroe Township, (J. Calvin Boyer), ...						
		99 Moore Water Co., (Plum Township), ...	....	1	....	1
210 Moreland Township, (see also Springfield Consolidated Water Company.)		100 Moreland Spring Water Co., ...	....	2	....	2
Morganza, Cecil Township, (see Penna. Reform School)						
		101 Morrellville and Cambria Boro Water Co., (Johnstown), ...	....	1	....	1
		102 Mountain Water Co., (U. Milford Township, Lehigh County and Emaus, extension of), ...	....	....	1	1
211 Mount Carmel Township, Northumberland Co. (Kulpmont Water Co.)						

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212 Mountville,	40	....	....	1	....	1
213 Muhlenberg Township, (Reading Suburban Water Co.)						
214 Mount Union,	....	103 Mount Union Water Co.,	....	1	....	1
215 Muncy,	....	104 Muncy Water Supply Co.,	....	....	1	1
Myerstown village, (Jackson Township, Lebanon Co.)		105 Myerstown Water Co.,	....	2	....	2
Nant-y-Glo village, (Black Lick and Jackson Townships, Cambria County),	....	....	17 Nant-y-Glo Water Company, (Unincorporated),	1	....	1
216 Narberth (Springfield Water Co.)						
		106 Natrona Water Co., (Harrison Township),	....	1	....	1
217 Nescopeck,	....	107 Nescopeck Water Supply Co.,	....	1	....	1
218 Neville Township, (Island) (Ohio Valley Water Co.)						
219 New Bethlehem, (Citizens Water Co. of New Bethlehem.)						
220 New Bloomfield, (Bloomfield Water and S. Co.)						
221 New Castle Township, (Minersville Water Co.)						
		108 New Chester Water Co., (supplies Chester City, Upland borough and L. Chichester Township),	....	3	....	3
222 New Cumberland, (Riverton Cons. Water Co.)						
223 Newport,	....	109 Newport Home Water Company, (also supplies Oliver Township),	....	1	....	1
224 Newport Township, (Luzerne County Central Poor District.)						
225 Nippenose Township, Lycoming County,	....	110 Nippenose Water Co.,	....	....	1	1
226 Norristown,	....	111 Norristown Ins. & Water Co., (also supplies Bridgeport and Plymouth Township, Montgomery County),	....	....	1	1
227 North Annville Township, (see also Annville Water Co.)		112 N. Annville Water Supply Co.,	....	1	....	1
228 North Braddock, (Penna. Water Co.)						
229 North Charleroi, (Charleroi Water Co.)						
230 North Cornwall Township,	....	113 N. Cornwall Water Supply Co.,	....	1	....	1
231 North Coventry Township, (Pottstown Gas & W. Co.)						
232 North East,	41	....	....	2	....	2
233 North Huntingdon Township, (Westmoreland Water Company of Hempfield Township.)						
234 North Irwin Township, (Westmoreland Water Co. of Hempfield Township.)						
235 North Lebanon Township, (Lebanon Valley Cons. Water Supply Co.)						
236 North Londonderry Township, (Londonderry Water Company), (Gravel Hill Water Supply Co.)						
237 North Manheim Township, Schuylkill Co.,	....	114 North Manheim Water Co.,	....	....	1	1
238 North Versailles Township, (E. McKeesport Water Co.)						
239 Norwegian Township, Schuylkill County, (Penn Land Company.)						
240 Norwich Township, (Crosby Gas Co.)						
241 Norwood, (Springfield Water Co.)						
Oak Lane, Phila, (Springfield Cons. Water Co.)						
242 Oakmont (Suburban Water Co. of Allegheny Co.)						

WATER WORKS PERMITS AND DECREES ISSUED BY THE COMMISSIONER OF HEALTH—Continued.

Place.	Owner of Water Works.			1905-10	1911	Total.
	Municipal.	Water Company.	Miscellaneous.			
		115 Ogontz Water Co., (Cheltenham Township), ...	....	1	....	1
		116 Ohio Valley Water Co., (supplies Avalon, Ben Avon, Bellevue, Emsworth, McKees Rocks and Westview boroughs, and Neville, Ross and Stowe Townships), ...	....	1	1	2
243 Oliver Township, (Newport Home Water Co.)						
244 Orbisonia, ...	....	....	18 Orbisonia Water Co., so called (Orbisonia and Rockhill), .	1	....	1
245 Osborne (Haysville Water Co.)						
Overbrook, Phila. (Springfield Water Co.)						
246 Oxford, ...	42	....	....	2	....	2
247 Paint (Windber Water and Power Co.)						
248 Paint Township, (Windber Water and Power Co.)						
		117 Panther Valley Water Co., (supplies Lansford borough, and Mauch Chunk Township, Carbon County, and Coaldale borough and Rahn Township, Schuylkill County and other districts in said counties. In 1907 purchased Mauch Chunk Township Water Co., that received permit in 1906), ...	....	2*	1	3
249 Parker, ...	....	118 Parker City Water Co., ...	....	....	1	1
250 Parkesburg, ...	....	119 Parkesburg Water Co., ...	....	1	....	1
251 Patton Township, (Penna. Water Co.)						
Paxtang Village, (Swatara Township, Dauphin Co.),	....	120 Paxtang Cons. Water Co., ...	....	3	....	3
252 Penbrook (Extension Water Co. of Penbrook)						
253 Penn, (Westmoreland Water Co. of Hempfield Twp.)						
			19 Penn Land Co., (Norwegian Township, Schuylkill Co.), ..	....	1	1
254 Pennsburg, ...	....	121 Pennsburg Water Co., ...	....	....	1	1
			20 Penna. Ind. Reformatory (Smithfield Township, near Huntingdon), ...	1	....	1
			21 Penna. Ref. School, Morganza (Cecil Township, Washington Co.), ...	1	....	1

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* One permit for 1906 to Mauch Chunk Township Water Co.

		122 Pennsylvania Water Company, (supplies Wilkinsburg borough, Braddock, Patton, Penn and Wilkins Townships, and E. Pittsburg, Edgewood, N. Braddock, Pitcairn, Rankin, Swissvale, Trafford City, Turtle Creek, and Wilmerding boros, and Pittsburgh, 13th Ward, ...	....	2	....	2
255 Penn Township, Allegheny County, (Penna. Water Company), (Unity Water Co.)						
256 Penn Township, Westmoreland County, (Westmoreland Water Co. of Hempfield Township.)						
257 Penn Township, York County, (Hanover and McSherrystown Water Co.)						
258 Perkasie, ...	....	123 Perkasie Water Supply Co., ...	....	1	2	3
259 Perry Township, (J. Calvin Boyer.)						
260 Philadelphia, (Jas. S. Williams,) (See also Oak Lane and Overbrook.)						
261 Phoenixville, ...	43	....	....	....	2	2
262 Pitcairn, (Penna. Water Co.)						
263 Pittsburgh City, (see also Penna. Water Co. for 13th Ward.)	44	....	....	1	....	1
		121 Pleasant Gap Water Supply Co., (Spring Township Centre Co.), ...	....	....	1	1
264 Pleasantville, ...	45	....	....	1	....	1
265 Plum Township, (Moore Water Co.)						
266 Plymouth Township, Montgomery Co. (Springfield Cons. Water Company), (Norristown Ins. and Water Co.)						
267 Port Allegany, ...	....	125 Port Allegany Water Co., ...	....	....	1	1
268 Portage (Martindale Water Co.)						
269 Portage Township, (Martindale Water Co.) (Bens Creek Water Co.)						
270 Portland, ...	....	126 Portland Water Co., (also supplies U. Mt. Bethel Township), ...	....	2	....	2
Port Matilda village, (Worth Township, Centre Co.)		127 Port Matilda Water Co., ...	....	1	....	1
271 Port Royal, ...	....	128 Port Royal Water Supply Co., (also supplies Milford and Turbett Townships), ...	....	1	1	2
272 Pottstown, ...	....	129 Pottstown Gas and Water Co., (also supplies N. Coventry and W. Pottsgrove Townships), ...	....	1	....	1
273 Prospect Park, (Springfield Water Co.)						
274 Punxsutawney, ...	....	130 Punxsutawney Water Co., (also supplies Big Run), ...	....	1	....	1
275 Quarryville, ...	....	131 Quarryville Water Co., ...	....	2	1	3
276 Radnor Township, (Springfield Cons. Water Co.)						
277 Rahn Township, (Panther Valley Water Co.)						
278 Ramey, ...	....	132 Ramey Water Co., (also supplies Bigler Township), ...	....	1	....	1
279 Rankin, (Penna. Water Co.)						
280 Rayburn Township, (Citizens Water Co. of Kittanning)						
281 Reade Township, (Blandburg Water Co.)						

WATER WORKS PERMITS AND DECREES ISSUED BY THE COMMISSIONER OF HEALTH—Continued.

Place.	Owner of Water Works.			1905-10	1911	Total.
	Municipal.	Water Company.	Miscellaneous.			
282 Reading City,	46	....	....	2	....	2
		133 Reading Sub. Water Co., (Muhlenberg Township),	....	1	1	2
283 Red Hill,	....	134 Red Hill Water Co.,	....	....	1	1
284 Red Lion,	....	135 Red Lion Water Co.,	....	....	1	1
285 Reilly Township, (Blackwood Water Co.),	....					
286 Renovo,	47	136 Reliance Water Company, (Franconia Township, Montgomery County),	....	....	1	1
Retreat village, (Luzerne Co., Central Poor District)	....	....	....	....	1	1
287 Richland Township, Clarion County, (Foxburg Water Works Company,)		137 Rheems Water Company, (West Donegal Township, Lancaster County),	....	....	1	1
288 Richland Township, Cambria County, (Windber Water and Power Co.)						
289 Ridgway,	48	....	....	3	....	3
290 Ridley Park (Springfield Water Co.)						
291 Ridley Township, (Springfield Water Co.)	....					
292 Rimersburg,	49	138 Ridley Water Co., (Eddystone),	....	2	....	2
293 Ringtown,	....	....	....	1	....	1
		139 Ringtown Spring Water Supply Co.,	....	1	....	1
		140 Riverton Consolidated Water Co., (supplies Camp Hill, Lemoyne, New Cumberland and Wormleysburg boroughs and E. Pennsboro, Fairview and Lower Allen Townships),	....	4	....	4
291 Rock Hill, (Orbisonia Water Co.),	....		22 Rochester, J. H., of Marion Centre Water Co., Uninc. (Marion Centre),	....	1	1
		141 Rock Hill Water Co., (Telford).	....	....	1	1
295 Rockledge, (Springfield Cons. Water Co.),	....					
		142 Roselawn Water Co., (Logan Township, Blair County),	....	1	1	2

296 Rose Township, (Brookville Water Co.)						
297 Ross Township, (Ohio Valley Water Co.)						
298 Rostraver Township, (Monessen Water Co.)						
299 Roulette Township, Potter County,	....	143 Roulette Water Co.,	....	1	....	1
300 Royalton, (Middletown and Swatara Cons. Water Co.)						
301 Rural Valley,	50		....	1	....	1
		144 Rutherford Heights Water Supply Co., (Swatara Township),	....	4	....	4
302 Saegertown,	51		....	....	2	2
303 St. Marys,	....	145 St. Marys Water Co.,	....	1	....	1
304 Salem Township, (W. Salem Water Supply Co.)						
305 Salladasburg,	....	146 Salladasburg Water Co.,	....	....	1	1
		147 Sand Spring Water Co., of Meyersdale,	....	....	1	1
306 Sankertown, (Cresson Water Co.)						
307 Sayre, (Bradford County Water Co.)						
308 Scalp Level, (Windber Water and Power Co.)						
309 Schuylkill Haven,	....	148 Schuylkill Haven Gas and Water Co., (also supplies Cressona),	....	2	1	3
310 Schuylkill Township, (Springfield Cons. Water Co.)						
311 Scranton City,	....	149 Scranton Gas and Water Co., (also supplies Dickson City borough and Throop)	....	1	....	1
312 Shade Township, (Windber Water and Power Co.)						
313 Sharon Hill, (Springfield Water Co.)	....					
			23 Shaver Bros. Water Works, (Kingston Township),	1	....	1
Shawnee village, (Smithfield Township, Monroe Co.),	....	150 Shawnee Water Supply Co.,	....	1	....	1
314 Sheffield village, (Sheffield Township, Warren Co.)	....	151 Sheffield Water Co.,	....	1	....	1
315 Shinglehouse,	....		24 Shinglehouse Water Co., (Unincorporated),	1	....	1
316 Shiremanstown,	....	152 Shiremanstown Water Co.,	....	2	....	2
317 Shrewsbury,	52		....	1	1	2
318 Slippery Rock,	53		....	1	....	1
319 Smithfield Township, Huntingdon County, (Penna. Ind. Reformatory.)						
320 Smithfield Township, Monroe County, (Shawnee Water Company),	....					
			25 Somerset County Poor Directors, (Home in Somerset Township),	1	....	1
321 Somerset Township, (Gladehurst Water Co.) (See also Somerset County Poor Directors.)						
322 South Annville Township (See also Annville Water Co.)		153 S. Annville Water Supply Co.,	....	1	....	1
323 South Bethlehem, Armstrong County, (Citizens Water Company of New Bethlehem)	....					
		154 South Bradford Water Co., (Bradford Township, McKean County),	....	1	....	1
		155 South Easton Water Co., (Easton),	....	1	1	2
324 South Fork,	....	156 South Fork Water Co.,	....	....	1	1
325 South Lebanon Township, (Lebanon Valley Cons. Water Supply Co.)						
326 South Middleton Township, (J. C. Bucher.)						
327 South Renovo,	54		....	1	....	1

WATER WORKS PERMITS AND DECREES ISSUED BY THE COMMISSIONER OF HEALTH—Continued.

Place.	Owner of Water Works.			1905-10	1911	Total.
	Municipal.	Water Company.	Miscellaneous.			
328 Spangler, (Barnesboro Water Co.)						
Spring City. (See E. Pennsylvania State Institute for Feeble Minded and Epileptic.)						
329 Springdale, (Inc. 1906), (See also Springdale Water Company), ...	55		....	....	1	1
330 Springdale Township, Allegheny County, (See also Tarentum Water Co.)	....	157 Springdale Water Co., (Inc. Apr. 27, 1905, for Springdale Township, Allegheny County, supplies Springdale), ...	....	1	....	1
331 Springetsbury Township, York County, (York Water Company),						
332 Springfield Township, Montgomery County, ...	....	158 Springfield Consolidated Water Co., (Supplies Radnor Township, Delaware County;) Easttown, Schuylkilll, Tredyffrin, W. Whiteland, Whitemarsh and Willstown Townships, Chester county; Abington, Cheltenham, Moreland, Plymouth, Springfield, Upper Dublin and Upper Merion Townships, and Conshohocken and Rockledge boroughs Montgomery County; and Oak Lane, Phila), ...	....	1	....	1
333 Springfield Township, Delaware County, ...	....	159 Springfield Water Co., (supplies Aldan, Clifton Heights, Collingdale, Colwyn, Darby, Eddystone, Glenolden, Lansdowne, Norwood, Prospect Park, Ridley Park, Sharon Hill and Yeadon boroughs, and Darby, Haverford, Marple, Ridley, Springfield, Tinicum and Upper Darby Townships, Delaware County; Lower Merion Township and Narberth borough, Montgomery County; and Overbrook, Philadelphia), ...	....	1	....	1

331 Spring Garden Township, (York Water Co.)							
335 Spring Township, Centre County, (Pleasant Gap Water Supply Co.), ...	....						
			26 State Asylum for Chronic Insane of Penna., (Wernersville P. O., Lower Heidelberg Township, Berks Co.),	....	1		1
336 State College, (See also University Water Co.)	....	160 State College, Water Co., (also supplies Harris Township), ...	....	1	....		1
			27 State Hospital for Insane, (Mahoning Township, near Danville), ...	3	....		3
337 Steelton, ...	56		....	3	....		3
			28 Stone, Raymond D., (Bridgeton Township), ...	1	....		1
338 Stonycreek Township, (Jackson Water Co.)							
339 Stowe Township, (Ohio Valley Water Co.)							
340 Stoystown, ...	....	161 Stoystown Water Co., ...	....	1	....		1
341 Stroudsburg, ...	....	162 Stroudsburg Water Supply Co., .	....	1	....		1
		163 Suburban Water Co. of Allegheny County, Pa. (Oakmont and Verona), ...	....	2	1		3
342 Sugar Creek Township, (Venango Oil and Land Co.)							
343 Sunbury, ...	....	164 Sunbury Water Co., ...	....	1	....		1
344 Susquehanna Township, (see also Dauphin Cons. Water Supply Company), ...	....	165 Susquehanna Township Water Company, ...	....	1	....		1
345 Swatara Township, (Rutherford Heights Water Supply Company), (Paxtang Cons. Water Co.), (Eastmere Water Company), (Beaver Creek Water Co.)							
346 Swissvale, (Penna. Water Co.)							
347 Tamaqua, ...	57		....	1	....		1
348 Tarentum, ...	....	166 Tarentum Water Co., (Purchased 1906 by Allegheny Valley Water Co., which has charter rights in Brackenridge, Cheswick and Tarentum boroughs, and E. Deer, Harmar, Harrison and Springdale Townships, Allegheny County). (Not active in Cheswick borough and Harmar and Springdale Townships), ...	....	1	....		1
349 Taylor Township, (W. Pittsburg Water Co.)							
350 Telford, (Rock Hill Water Co.), ...	....						
		167 Telford Water Co., (West Telford), ...	....	....	1		1
351 Thompsontown, (H. W. Wickersham.)							
352 Throop, (Scranton Gas and Water Co.)							
353 Tinicum Township, (Springfield Water Co.)							
354 Towanda, ...	....	168 Towanda Water Works Co., (also supplies Monroe), ...	....	1	....		1
355 Trafford City, (Borough), (Penna. Water Co.)							
356 Tredyffrin Township, (Springfield Cons. Water Co.)							
357 Tremont, ...	....	169 Tremont Water and Gas Co., ...	....	1	....		1

WATER WORKS PERMITS AND DECREES ISSUED BY THE COMMISSIONER OF HEALTH—Continued

Place.	Owner of Water Works.			1905-10	1911	Total.
	Municipal.	Water Company.	Miscellaneous.			
		170 Treverton Water Supply Co., (Zerbe Township, Northumberland County),	....	1	....	1
		171 Trevose Manor Spring Water Co., (Bensalem Township, Bucks County),	....	1	....	1
		172 Trout Run Water Co., (Duncannon),	....	1	....	1
358 Turbett Township, (Port Royal Water Supply Co.)						
359 Turtle Creek, (Penna. Water Co.)						
360 Tyrone, (Bald Eagle Water Co.)						
361 Uniontown.	....	173 Uniontown Water Co.,	....	1	....	1
362 Unionville,	58		....	....	1	1
		174 Unity Water Co., (Penn Township, Allegheny Co.),	....	1	....	1
		175 University Water Co., (supplies College and Ferguson Townships and State College boro, Centre County),	....	1	....	1
363 Upland. (New Chester Water Co.)						
364 Upper Darby Township, (Springfield Water Co.)						
365 Upper Dublin Township, (Springfield Cons. Water Co.)						
Upper Mauch Chunk, (Mauch Chunk, Carbon Co.),	....	176 Upper Mauch Chunk Water Co., Inc. Oct. 26, 1872,	....	1	....	1
366 Upper Merion Township, (Springfield Cons. Water Co.)						
367 Upper Milford Township, (Mountain Water Co.)						
368 Upper Mt. Bethel Township, (Portland Water Co.)	....					
			29 Venango Oil and Land Co., (Sugar Creek Township),	1	....	1
		177 Venango Water Co., (Purchased by city of Franklin),	....	3	....	3
369 Verona, (Suburban Water Co. of Allegheny Co., Pa.)	....					
			30 Vesta Coal Co., (Point View Village, E. Bethlehem Township, Washington Co.),	....	1	1
370 Wall, (East McKeesport Water Co.)						
371 Warren,	....	178 Warren Water Co.,	....	2	....	2
372 Washington Township, (Blue Ridge Water Supply Co.)						
373 Waterford,	....	179 Waterford Water Co.,	....	1	....	1
374 Wayne Township, Lawrence Co., (Ellwood Water Co.)						

375 Weatherly,	....	180 Weatherly Water Co.,	....	1	....		1
		181 Weldon W. Co., (Abington Township),	....	1	....		1
376 Wellsboro,	....	182 Wellsboro Water Co.,	....	2	....		2
Wernersville, (See State Asylum)							
377 West Berwick,	....	183 West Berwick Water Supply Co.,	....	1	....		1
378 West Bethlehem Township, (Marianna Water Co.)							
379 West Chester,	59		....	1	....		1
380 West Donegal Township, Lancaster Co., (Rheems Water Company.)							
381 Westfall Township, Pike County, (Matamoras Citizens Water Co.)							
382 West Hazleton, (Diamond Water Co. of Hazleton),	....						
		184 West Houtzdale Water Co., (Woodward Township and Brisbin borough),	....	1	....		1
383 West Manchester Township, (York Water Co.)							
384 Westmont, (Johnstown Water Co.)							
		185 Westmoreland Water Co., of Hempfield Township, (One of 8 companies operating systems supplying Greensburg (part), Hempfield, N. Huntingdon and Penn Townships and Irwin, Jeannette, Manor, N. Irwin, Penn and Youngwood boros)...	....	1	....		1
West Pittsburg, village, Taylor Township,	....	186 West Pittsburgh Water Co., (for Taylor Township, Lawrence County),	....	2	....		2
385 West Pottsgrove Township, (Pottstown Gas and Water Co.)							
386 West Telford. (Telford Water Co.)	....						
		187 West Salem Water Supply Co., (Salem Township, Luzerne County),	....	1	....		1
387 West Whiteland Township, (Springfield Cons. Water Company.)							
388 West View, (Ohio Valley Water Co.)							
389 Whitemarsh Township, (Springfield Cons. Water Co.)							
390 Wickboro, (Citizens Water Co. of Kittanning),	....						
			31 Wickersham, H. W. (Thompsontown),	1	....		1
391 Wilkinsburg, (Penna. Water Co.)							
392 Wilkins Township, (Penna. Water Co.)	....						
			32 Williams, Jas. S., (Phila.),..	1	....		1
393 Williamsport City, (see also Citizens Water and Gas Co. of Williamsport),	....	188 Williamsport Water Co.,	....	1	....		1
394 Willistown Township, (Springfield Cons. Water Co.)							
395 Wilmerding, (E. McKeesport Water Co.) (Penna. Water Co.)							

WATER WORKS AND DECREES ISSUED BY THE COMMISSIONER OF HEALTH—Continued.

Place.	Owner of Water Works.			1905-10	1911	Total.
	Munici-pal.	Water Company.	Miscellaneous.			
396 Windber,	....	189 Windber Water and Power Co., (also supplies Scalp Level borough, Richland Township, Cambria County; Paint and Windber boroughs, Paint and Shade Townships, Somerset County),	....	2	....	2
397 Woodlawn, (Jones and Laughlin Steel Co.)						
398 Woodward Township, (W. Houtzdale Water Co.)						
399 Wormleysburg, (Riverton Cons. Water Co.)						
400 Worth Township, (Port Matilda Water Co.)						
401 Wrightsville,	....	190 Wrightsville Water Supply Co...	....	1	....	1
402 Wyalusing,	....	191 Wyalusing Water Co.,	....	1	....	1
.			33 Wyland, John F., (Hampton Township),	....	1	1
403 Yeadon, (Springfield Water Co.)						
404 Yoe,	....	192 Yoe Water Co.,	....	1	....	1
405 York City,	....	193 York Water Co., (also supplies Hellam, Manchester, Springetsbury, Spring Garden and W. Manchester Townships, York County),	....	2	1	3
406 Youngwood, (Westmoreland Water Co. of Hempfield Township.)						
407 Zerbe Township, (Treverton Water Supply Co.),	....		34 Zierdon, W. E., (Johnsonburg),	1	....	1

Of the 286 water works systems, the subjects of permits or decrees, (and it should be understood that every permit is a decree, but that every decree is not necessarily a permit), 81 systems obtain their sources of supply from ground water only, 117 from surface sources only, and 88 from both ground and surface water sources. In the following table are given the names of the owners of the water works systems, the subjects of permits or decrees, that secure, or propose to secure, their sources of supply from ground waters only:

WATER WORKS SYSTEMS SUPPLIED FROM GROUND WATER SOURCES ONLY WHICH HAVE BEEN THE SUBJECTS OF PERMITS OR DECREES. 1905-1911.

Water Works System.	Ground water sources.	
	Wells	Springs
1. Akron borough,	X	....
2. Albion borough,	....	X
3. Allison Park Water Co.,	X	....
4. Alwine, Jerry,	....	X
5. Annville Water Co.,	X	X
6. Avonmore borough,	X	....
7. Baden borough,	X	....
8. Bethlehem borough,	X	....
9. Biglerville Water Co.,	....	X
10. Bloomfield Water & Sewer Co.,	....	X
11. Blue Ridge Water Supply Co.,	X	....
12. Boyer, J. Calvin, (Perry twp.),	....	X
13. Brickel, B. W.,	X	....
14. Bucher, J. C.,	X	....
15. Catasauqua borough,	X	....
16. Conneaut Lake borough,	X	....
17. Conneautville borough,	....	X
18. Conway borough,	X	....
19. Coopersburg borough,	X	X
20. Crosby Gas Co.,	....	X
21. Curtis, J. G., Leather Co.,	....	X
22. Dallas Water Co.,	....	X
23. Dickerson Run Water Co.,	X	....
24. Dillsburg Water Co.,	....	X
25. Dover borough,	X	....
26. East Brady Water Works Co.,	X (auxil.)	X
27. Edinboro borough,	X	....
28. Emaus borough,	X	X
29. Ephrata borough,	X	X
30. Farwell, Absalom,	....	X
31. Gladehurst Water Co.,	....	X
32. Greencastle borough,	....	X
33. Hellam Water Co.,	....	X
34. Hershey, M. S.,	....	X
35. Heidelberg Water Co.,	....	X
36. Hilltown Water Co.,	X	....
37. Jones & Laughlin Steel Co.,	X	....
38. Josephine Water Co.,	X	....
39. Knoxville borough,	X	X
40. Lansdale Water Co.,	X	....
41. Madera Water Co.,	....	X
42. Mars borough,	X	....
43. Matamoras Citizens Water Co.,	X	....
44. Mountain Water Co.,	X	X
45. Mountville borough,	X	X
46. Ohio Valley Water Co.,	X	....
47. Orbisonia Water Co.,	....	X
48. Oxford borough,	X	....
49. Parkesburg Water Co.,	X	X
50. Paxtang Consolidated Water Co.,	....	X
51. Pleasant Gap Water Supply Co.,	....	X
52. Pleasantville borough,	X	....
53. Port Matilda Water Co.,	....	X
54. Red Lion Water Co.,	X	X
55. Reliance Water Co.,	X	....
56. Rheems Water Co.,	X	....
57. Rimersburg borough,	X	....
58. Ringtown Spring Water Supply Co.,	X	....
59. Rochester, J. H., (Marion Center W. Co., uninc.),	....	X
60. Rock Hill Water Co.,	X	....
61. Roselawn Water Co.,	X	....
62. Rural Valley borough,	X	....
63. Shawnee Water Supply Co.,	....	X
64. Shinglehouse Water Co.,	X	X
65. Slippery Rock borough,	X	....
66. Somerset County Poor Directors,	X	X
67. South Bradford Water Co.,	....	X

WATER WORKS SYSTEMS SUPPLIED FROM GROUND WATER SOURCES ONLY WHICH HAVE BEEN THE SUBJECTS OF PERMITS OR DECREES. 1905-1911—Continued.

Water Works System.	Ground water sources.	
	Wells	Springs
68. South Easton Water Co.,	X	X
69. Springdale borough,	X	....
70. Springdale Water Co.,	X	....
71. Stone, Raymond D.,	....	X
72. Stoystown Water Co.,	X	....
73. Telford Water Co.,	X	....
74. Trevorton Water Supply Co.,	....	X
75. Trevose Manor Spring Water Co.,	....	X
76. Unionville borough,	....	X
77. Venango Oil & Land Co.,	....	X
78. Waterford Water Co.,	....	X
79. Williams, J. S.,	X	....
80. Wyland, John F.,	X	....
81. Zierdon, W. E.,	X	....

It appears that the ground water sources, sub-divided, are as follaws:

Wells only,	38
Springs only,	30
Wells and Springs,	13
Total,	81

The water works systems which have been made the subject of permits or decrees, which systems obtain, or propose to obtain, their supplies from surface waters only, are given in the following table:

WATER WORKS SYSTEMS SUPPLIED FROM GROUND WATER SOURCES WHICH HAVE BEEN MADE THE SUBJECTS OF PERMITS OR DECREES. 1905-1911.

Water Works System.	Remarks.
1. Albion Water Co.,	Not built.
2. Bald Eagle Water Co.,	
3. Barnesboro Water Co.,	Sells to another company.
4. Beaver Creek Water Co.,	
5. Bens Creek Water Co.,	
6. Blandburg Water Co.,	
7. Blossburg Water Co.,	
8. Boalsburg Water Co.,	
9. Boyer, J. Calvin (Monroe twp.),	
10. Bradford County Water Co.,	Not built.
11. Bright Run Water Co.,	
12. Bristol borough,	
13. Bristol Water Co.,	
14. Brockway Crystal Water Co.,	
15. Brookville Water Co.,	
16. Butler Water Co.,	
17. Chambersburg borough,	
18. Charleroi Water Co.,	
19. Chichester Water Co.,	Supply from New Chester W. Co.
20. Citizens Water and Gas Co. of Williamsport,	
21. Citizens W. Co. of New Bethlehem,	
22. Clearfield Water Co.,	
23. Clymer Water Co. of Indiana,	
24. Cresson borough,	Supply from Summit W. S. Co.
25. Dingmans Ferry Water Co.,	
26. Donora Water Co.,	Supply from Monessen W. Co.
27. DuBois borough,	
28. Eastmere Water Co.,	Sold to Harrisburg and former source discontinued.

WATER WORKS SYSTEMS SUPPLIED FROM SURFACE WATERS ONLY WHICH HAVE BEEN MADE THE SUBJECTS OF PERMITS OR DECREES. 1905-1911—Continued.

Water Works System.	Remarks.
29. Ebensburg Coal Co.,	
30. Edgemont Water Co.,	Supply from New Chester W. Co.
31. Ellwood Water Co.,	
32. Emporium Water Co.,	
33. Extension Water Co. of Penbrook,	Supply from Susquehanna Township Water Co.
34. Fairchance borough,	Supply from water company.
35. Fairview Water Co.,	Not built.
36. Falls Creek borough,	
27. Freeport Water Works Co.,	
38. Gilberton-Schuylkill Water Co.,	Supply from Bright Run W. Co.
39. Girardville Water Co.,	Supply from Bright Run W. Co.
40. Glen Brook Water Co.,	Not built.
41. Gravel Hill Water Supply Co.,	Supply from Lebanon Valley Con. W. S. Co.
42. Hallstead Water Co.,	Supplies another company.
43. Harrisburg City,	
44. Honesdale Consolidated Water Co.,	Sells to other companies.
45. Horner, H. M.,	
46. Hummelstown Consolidated Water Co.,	Sells to another company.
47. Huntingdon Water Supply Co.,	
48. Jersey Shore Water Co.,	
49. Johnstown Water Co.,	Emergency supply from another company.
50. Juniata Borough,	
51. Kulpmont Water Co.,	
52. Lancaster City,	
53. Latrobe Water Co.,	
54. Lebanon Valley Consolidated Water Supply Co.,	Supplies other companies.
55. Ligonier borough,	
56. Lock Haven City,	
57. McKeesport City,	
58. Marianna Water Co.,	
59. Marietta Gravity Water Co.,	
60. Marie Water Co.,	
61. Martindale Water Co.,	
62. Masontown borough,	
63. Middletown and Swatara Cons. Water Co.,	
64. Minersville Water Co.,	
65. Monessen Water Co.,	Supplies Donora W. Co.
66. Moore Water Co.,	Supply from Suburban W. Co. of Allegheny County, Pa.
67. Mt. Union Water Co.,	
68. Muncy Water Supply Co.,	
69. Nant-y-Glo Water Co. (unincorporated),	
70. New Chester Water Co.,	Supplies other companies.
71. Nippenose Water Co.,	
72. Norristown Insurance and Water Co.,	
73. North Annville Water Supply Co.,	Supply from Lebanon Valley Con. W. S. Co.
74. North Cornwall Water Supply Co.,	Supply from Lebanon Valley Con. W. S. Co.
75. North Manheim Water Co.,	
76. Parker City Water Co.,	
77. Penn Land Co.,	
78. Pennsylvania Water Co.,	Sells to other companies.
79. Perkasie Water Supply Co.,	
80. Phoenixville borough,	
81. Pittsburgh City,	
82. Portland Water Co.,	
83. Pottstown Gas and Water Co.,	
84. Renovo borough,	
85. Ridgway borough,	
86. Ridley Water Co.,	Supply from New Chester Water Co.
87. Riverton Consolidated Water Co.,	Sells to another company.
88. Rutherford Heights Water Supply Co.,	Supply from Hummelstown Cons. Water Co.
89. Salladasburg Water Co.,	
90. Schuylkill Haven Gas and Water Co.,	
91. Scranton Gas and Water Co.,	Sells to other companies.
92. Sheffield Water Co.,	
93. Shiremanstown Water Co.,	Supply from Riverton Cons. Water Co.
94. South Annville Water Supply Co.,	Supply from Lebanon Valley Con. W. S. Co.
95. South Fork Water Co.,	
96. South Renovo borough,	
97. Springfield Consolidated Water Co.,	Supplies other companies.
98. Springfield Water Co.,	Supplies other companies.
99. State Asylum for Chronic Insane of Penna.,	
100. State College Water Co.,	Sells to another company.
101. Steelton borough,	
102. Suburban Water Co. of Allegheny County, Pa.,	Supplies other companies.
103. Sunbury Water Co.,	
104. Susquehanna Township Water Co.,	Supply from Rutherford Heights W. S. Co.

WATER WORKS SYSTEMS SUPPLIED FROM SURFACE WATERS ONLY WHICH HAVE BEEN MADE THE SUBJECTS OF PERMITS OR DECREES. 1905-1911—Continued.

Water Works System.	Remarks.
105. Tamaqua borough,	
106. Tarentum Water Co.,	
107. Uniontown Water Co.,	
108. Unity Water Co.,	Supply from Suburban W. Co. of Allegheny County, Pa.
109. University Water Co.,	Buys of one and sells to another company.
110. Warren Water Co.,	
111. Weatherly Water Co.,	
112. West Chester borough,	
113. Westmoreland Water Co. of Hempfield township,	Co-operates with other water companies.
114. West Pittsburg Water Co.,	
115. Windber Water and Power Co.,	Supplies other companies.
116. Wyalusing Water Co.,	
117. York Water Co.,	Supplies other companies.

The water works systems which are supplied from both surface and ground water sources that have been made the subject of permits or decrees are named in the following table:

WATER WORKS SYSTEMS SUPPLIED FROM SURFACE AND GROUND WATER SOURCES ONLY WHICH HAVE BEEN MADE THE SUBJECTS OF PERMITS OR DECREES. 1905-1911.

Water Works System.	Wells.	Springs.	Surface.
1. Arendtsville Water Co.,	....	X	X
2. Austin borough,	X	X	X
3. Bath borough,	....	X	X
4. Berwick Water Co.,	....	X	X
5. Blackwood Water Co.,	....	X	X
6. Bradford City,	X	....	X
7. Briar Creek Water Supply Co.,	....	X	X
8. Cambridge Springs borough,	X	....	X
9. Catawissa Water Co.,	X	X	X
10. Christiana Gravity Water Co.,	X	X	X
11. Citizens Water Co. of Gordon,	....	X	X
12. Citizens Water Co. of Kittanning,	X	X	X
13. Clarion Water Co.,	X	....	*X
14. Cresson Water Co.,	X	X	‡X
15. Dauphin Consolidated Water Supply Co.,	X	....	X
16. Denver borough,	....	X	X
17. Diamond Water Co. of Hazleton,	X	X	X
18. Doylestown borough,	X	X	*X
19. DuBois, John E.,	....	X	X
20. Eagles Mere Water Co.,	X	....	†X
21. East. Penna. State Inst. for Feeble Minded and Epileptic,	X	....	X
22. East McKeesport Water Co.,	....	X	X
23. Emlenton Water Co.,	X	....	X
24. Foxburg Water Works Co.,			
Franklin City (purchased Venango Water Co.),	X	....	X
25. Galeton-Eldred Water Co.,	....	X	X
26. Glen Rock borough,	X	X	X
27. Hamilton Water Co.,	....	X	X
28. Hanover & McSherrystown Water Co.,	....	*X	X
29. Haysville Water Co.,	*X	X	X
30. Hazleton Water Co.,	X	....	X
31. Houtzdale Water Co.,	X	....	X
32. Huntingdon State Reformatory,	....	X	†X
33. Hyndman Water Co.,	X	....	X
34. Jacks Mountain Water Co.,	....	X	X
35. Jenkintown Water Co. (from Moreland Spring W. Co.),	X	X	X
36. Koppel Water Co.,	*X	....	X
37. Lebanon City,	†X	....	X
38. Lehigh Water Co.,	....	X	X
39. Londonderry Water Co.,	X	X	X

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*Emergency.
†Auxiliary.
‡Proposed.

WATER WORKS SYSTEMS SUPPLIED FROM SURFACE AND GROUND WATER SOURCES MADE THE SUBJECTS OF PERMITS AND DECREES. 1905-1911—Continued.

Water Works System.	Wells.	Springs.	Surface.
40. Luzerne County Central Poor District.	X	....	X
41. Macungie borough,	....	X	X
42. Mabauoy City Water Co.,	X	....	X
43. Mechaniesburg Gas & Water Co.,	....	X	X
44. Millersburg Home Water Co.,	X	X	X
45. Milnesville Water Co.,	....	X	X
46. Mokoma Spring Water Co.,	....	X	X
47. Moreland Spring Water Co.,	X	X	X
48. Morganza State School,	X	X	X
49. Morrellville & Cambria Boroughs Water Co.,	X	....	X
50. Myerstown Water Co.,	....	X	X
51. Natrona Water Co.,	....	X	X
52. Nescopeck Water Supply Co.,	....	X	X
53. Newport Home Water Co.,	X	X	X
54. North East borough,	....	X	X
55. Ogontz Water Co. (from Moreland Spring Water Co.),	X	X	X
56. Panther Valley Water Co.,	X	....	X
57. Pennsburg Water Co.,	....	X	X
58. Port Allegany Water Co.,	X	X	X
59. Port Royal Water Supply Co.,	....	X	X
60. Punxsutawney Water Co.,	†X	....	X
61. Quarryville Water Co.,	....	X	X
62. Ramey Water Co.,	X	....	X
63. Reading City,	....	X	X
64. Reading Suburban Water Co.,	X	....	X
65. Red Hill Water Co.,	....	X	X
66. Roulette Water Co.,	....	X	X
67. Saegertown borough,	X	....	§X
68. St. Marys Water Co.,	X	....	X
69. Sand Spring Water Co. of Meyersdale,	X	....	X
70. Shaver Brothers,	X	....	X
71. Shrewsbury borough,	X	X	‖X
72. Spring City State Hospital,	X	....	X
73. Stroudsburg Water Supply Co.,	....	X	X
74. Towanda Water Co.,	....	X	X
75. Tremont Water & Gas Co.,	....	X	X
76. Trout Run Water Co.,	....	X	X
77. Upper Mauch Chunk Water Co.,	....	X	X
78. Venango Water Co. (sold to Franklin),	X	X	X
79. Vesta Coal Co.,	X	X	X
80. Weldon Water Co. (from Moreland Spring Water Co.),	X	X	X
81. Wellsboro Water Co.,	....	X	X
82. West Berwick Water Supply Co.,	....	X	X
83. West Houtzdale Water Co.,	X	....	X
84. West Salem Water Supply Co.,	....	X	X
85. Wickersham, H. W.,	....	X	X
86. Williamsport Water Co.,	†X	....	X
87. Wrightsville Water Supply Co.,	....	X	X
88. Yoe Water Co.,	....	X	X

†Auxiliary.
§Without permit.
‖For ram.

SUMMARY OF SOURCES.

There are 169 water works systems having ground water sources in whole or in part, and 205 systems having surface water sources in whole or in part.

Of the 169 instances where the supply is ground water in whole or in part it is obtained from wells in 65 cases, from springs in 70 cases, and from wells and springs in 21 cases.

In 3 instances only do the surface waters come from natural bodies of water or lakes, namely, the Honesdale Consolidated Water Company, the Myerstown Water Company, of Jackson Township, Lebanon County, and the Eagles Mere Water Company.

WATER FILTERS MADE THE SUBJECTS OF PERMITS OR DECREES.

There are 67 water works systems operating filter plants which have been made the subjects of permits or decrees. These 67 systems comprise a total of 72 plants in operation and one abandoned old crib filter, so that 73 filter designs in all have been examined and passed upon, as appears from the following table. The permits to the City of Reading cover four plants; the permits to the Springfield Companies cover four plants; and two filter designs have been considered for the Schuylkill Haven Gas and Water Company, the first having been disapproved. In addition to the 67 systems operating filter plants, 10 water works systems have received permits or decrees relative to furnishing filtered water from the plants of other systems.

WATER FILTERS MADE THE SUBJECTS OF PERMITS OR DECREES.

Water Works.	Type of Filter Plant.			
		Mechanical.		
	Slow sand.	Gravity.	Pressure.	Miscellaneous.
1. Ablion Water Co. (water works not built),				Vertical not built
2. Beaver Creek Water Co.,		New		
3. Berwick Water Co.,		New		
4. Bristol borough,		Not built		
6. Brookville Water Co.,		New		
7. Butler Water Co.,		Old		
8. Cambridge Springs borough,		New		
9. Charleroi Water Co.,		New		Old crib.
10. Citizens Water Co. of Kittanning (sold to Armstrong Water Co.),				Old crib not used
11. Citizens Water Co. of New Bethlehem,		Addition		
12. Clarion Water Co.		Remodeled		
13. Clymer Water Co. of Indiana,		New		
14. Danville State Hospital,		Addition		
15. Dauphin Cons. W. S. Co.,		New		
Donora W. Co. (Supply for Monessen Water Co.)				
16. Eagles Mere Water Co.,			New	
17. Ellwood Water Co.,		New		
Franklin has purchased Venango Water Co.		New		
18. Freeport Water Works Co., Gravel Hill W. S. Co., from Leb. Val. Con. W. S. Co.),		New New		
19. Hanover & McSherrystown Water Co.,				Old vertical.
20. Harrisburg City,		Old		
21. Haysville Water Co.,				Crib not built.
22. Hummelstown Cons. W. Co.,		New		
23. Huntingdon W. S. Co.,				Addition semi-slow
Jenkintown W. Co. (supply from Moreland Spring W. Co.),				
24. Lancaster City,				Old semi-slow
25. Lebanon City,		Not built		
26. Lebanon Valley Cons. W. S. Co.		New		
27. Lehigh Water Co.,				Old crib.
28. McKeesport City,		New		
29. Marianna Water Co.,		New		
30. Masontown borough,		New		
31. Mechanicsburg Gas & W. Co.,		New		
32. Middletown & Swatara Cons. Water Co.,		New		
33. Monessen Water Co.,		Addition		
Moore Water Co. (supply from Suburban W. Co. of Allegheny County. Pa.),				
34. Moreland Spring W. Co.,		New		
35. Morganza State School,	New			
36. Muncy Water Supply Co.,				New strainer
37. Myerstown Water Co.,				
38. Natrona Water Co.,		New		
39. New Chester Water Co.,		Addition		
40. Newport Home W. Co.,		New		
41. Norristown Insurance & Water Co.,		Addition		

WATER FILTERS MADE THE SUBJECTS OF PERMITS OR DECREES.—Continued.

Water Works.	Type of Filter Plant.			
	Slow sand.	Mechanical.		Miscellaneous.
		Gravity.	Pressure.	
North Annville W. S. Co. (supply from Lebanon Valley Cons. W. S. Co.),	....	....	....	....
42. North East borough,	....	....	New	....
North Cornwall W. S. Co. (supply from Leb. Val. Cons. W. S. Co.),	....	....	....	....
Ogontz W. Co. (supply from from Moreland Spring W. Co.), Co.),	....	....	....	....
43. Parker City Water Co.,	....	New	....	Old crib.
44. Pennsylvania Water Co.,	....	New	....	Old crib.
45. Perkasie Water Supply Co.,	....	New	....	....
46. Pittsburgh City,	Addition	....	....	....
47. Pottstown Gas & Water Co.,	....	New	....	....
48. Punxsutawney Water Co.,	....	....	New	....
49. Quarryville Water Co.,	....	New	....	....
50. Reading City,	2 old 2 new	....	....	....
51. Ridgway borough,	....	New	....	....
52. Riverton Cons. W. Co.,	....	New	....	....
53. Schuylkill Haven Gas & Water Co.,	....	New, not built	New, disapproved and not built.	....
54. Scranton Gas & Water Co.,	....	New	....	....
South Annville W. S. Co. (supply from Leb. Val. Cons. W. S. Co.),	....	....	....	....
55. South Fork Water Co.,	....	New	....	....
56. Spring City State Hosp. (supply from Home W. Co. of Royersford),	....	Old	....	....
57. Springfield Cons. W. Co., also operates N. Springfield W. Co.	Old	Old	....	....
58. Springfield Water Co.,	....	....	Old	....
59. State Asylum for Chronic Insane of Penna. (Wernersville),	....	New	....	....
60. Steelton borough,	New	....	....	New scrubbers.
61. Sunbury Water Co.,	....	Old	....	....
62. Suburban W. Co. of Allegheny County, Pa.,	....	New	....	Old crib.
63. Tarentum Water Co.,	....	New	....	....
Unity Water Co. (supply from Suburban W. Co. of Allegheny County, Pa.),	....			
64. Venango Water Co. (sold to Franklin City),	....	New	....	....
65. Warren Water Co.,	....	New	....	....
Weldon Water Co. (supply from Moreland Spring Water Co.),	....	....	....	....
66. West Pittsburgh Water Co.,	....	New	....	....
67. York Water Co.,	....	Addition	....	....

SUMMARY OF FILTERS MADE THE SUBJECTS OF PERMITS OR DECREES.

Type of plant.	Old Plants.			New plants.	Not built.	Abandoned.	Total.
	Unchanged.	Extended.	Rebuilt.				
Slow sand,	3	1	....	4	....	....	8
Mechanical gravity,	5	6	1	35	3	....	50
Mechanical pressure,	1	....	....	5	1	....	7
Semi-slow,	1	1	....	....	....	....	2
Crib only,	1	....	....	....	1	1	3
Strainers,	1	....	....	1	1	....	3
All types,	12	8	1	45	6	1	73

From the above table it appears that the mechanical or rapid type of filter predominates in favor and further that the unreliability of the old cribs and strainers to furnish a safe supply from polluted sources is being recognized. Under the heading "Strainers" are grouped crude filter designs, so called, which cannot be included in any of the generally recognized type groups. Only two strainers and one crib have been proposed to the Department of Health for approval for new construction by all the water works systems which have been passed upon in permits or decrees. Of these only one of the strainers was to be built because with chemical disinfection a certain degree of protection would be afforded until adequate purification of the supply is secured.

SEWERAGE.

14. SEWERAGE AND SEWAGE DISPOSAL PERMITS AND DECREES ISSUED BY THE COMMISSIONER OF HEALTH UP TO DECEMBER 31st, 1911.

The issuing of sewerage and sewage disposal permits and decrees has been done under Act 182 of 1905. This law is a distinct departure in Pennsylvania State Medicine, in that it provides for State prevention of water-borne diseases. Formerly the powers committed by statute to the State Board of Health relative to regulations tending to limit the spread of infection by water carriage were advisory only. It was within the Board's sphere and duty at all times to recommend to the local authorities, having the usual powers in matters relating to the preservation of public health, the adoption of effective sanitary and preventive regulations and measures in anticipation of possible future epidemics.

The policy of limiting the State Department of Health to powers of an advisory character only, until the actual presence of an epidemic threatens everybody in the community, so vividly shown to be suicidal in the extreme at Butler, in the memorable epidemic of 1903-04, ceased with the enactment of the law of 1905. In the prosecution of the work under this new law, precedents have had to be established. It has been pioneer effort.

Sewage is defined in the Act as "any substance that contains any of the waste products in excrementitious or other discharges from the bodies of human beings or animals." Slops, sink and wash water come within the meaning of the term. The prevailing idea that laundry water and drainage from bath-tubs is not sewage is gradually being dispelled; but not without some educational effort in making clear that such waters very frequently contain pathogenic poison, and that they are often discharged onto the surface of the ground near springs and wells, or into street gutters, and thence to streams used below as sources of public water supply. Some manufacturing wastes are not sewage as above defined, but if a menace to public health, they are subject to regulation at the discretion of the Commissioner of Health.

The law stipulates that no person, corporation or municipality shall place or permit to be placed or discharge or permit to flow into any of the waters of the State any sewage except as specially provided; but the Act does not apply to waters pumped or flowing from coal mines or tanneries. Neither does it prevent the discharge of sewage from any public sewer system owned and maintained by a municipality, provided such sewer system was in operation and was discharging sewage into any State waters at the time of the passage of the Act. The exception noted, however, does not permit the discharge of sewage from a sewer system extended subsequent to the passage of the Act. A copy of the law has been sent to every municipality.

Therefore, it is understood that so long as a municipal sewer system in use before April 22nd, 1905, be not extended, the law is not applicable and the sewage therefrom may continue to defile the public water supply. What constitutes an extension has been the subject of considerable contention by local officials. A sewer system must, in the course of events, be extended. Department officers and agents have been instructed that evidently the intent of the law is to bring, as soon as possible, all municipal sewer systems under State regulation and control, to the end that the purity of the waters of the State for the protection of the public health shall be accomplished.

Unapproved sewer extensions to an existing sewer outlet whereby the volume of filth discharged into a stream is quadrupled would defeat the object of the law and be contrary to the letter thereof. It is understood that the State officials have determined that it is the principle involved which shall control and not the length of the sewer extension.

The law further provides that upon application duly made to the Commissioner of Health by public authorities having by law charge of a sewer system of any municipality, the Governor, Attorney General and the Commissioner of Health, shall consider the case and whenever it is their unanimous opinion that the general interests of the public health would be subserved thereby, the Commissioner of Health may issue a permit for the discharge of sewage from such public sewer system into any of the waters of the State and may stipulate in the permit the conditions, on which discharge will be permitted. The permit before being operative must be recorded in the office of the Recorder of Deeds for the county wherein the outlet for the sewer system is located.

As understood, the policy inaugurated is to bring about the abandonment of streams as carriers of sewage. All sewage must finally cease to be discharged, untreated, into any waters used subsequently for drinking purposes.

In a municipality the limit of whose borrowing capacity has been about reached, the erection of sewage purification works for the present is thus prevented. However, it is the policy of the State, set forth in the permit, to require this municipality, or any other, in extending its sewers, to make such extensions in compliance with plans contemplating treatment works in the future.

It also appears by what follows that a town should obviate the making of a petition every time a petty sewer extension is contemplated, by the submission in the first instance of a general application for sewer extension, involving the question once for all of State policy for that particular municipality. State approval under these circumstances implies careful consideration of the problems involved. The principal one relates to the disposition of the sewage.

A private corporation duly chartered by the State, and to which local authorities have granted a franchise for the construction, operation and maintenance of a public sewer system, is considered to be classed with the municipal corporation to the extent that plans must be filed and extensions approved. All other private corporations and companies and individuals that at the time of the passage of the Act, were discharging sewage into any of the waters of the State, may continue such discharge unless otherwise ordered. In a borough the remedy for the sources of pollution may be connection with a public sewerage system.

The student of the permits may note that one feature is based on the proposition that it is not practicable to treat large volumes of mingled sewage and storm water, owing to the prohibitive cost. Usually it is cheaper and better to build separate sewers for sanitary household drainage and to provide other channels for the removal of rain water.

Another feature is based on the proposition that efficiency and economy in preserving the purity of streams for the public protection dictate that sewers shall be built to conform to a comprehensive plan. Municipalities are learning that patchwork methods are bound to cause trouble, expensive alterations and repairs, and that those towns which have employed competent consulting engineers to lay out comprehensive systems and have thereafter conformed to the plan in construction, have usually found such a course to be profitable.

During the year 80 sewerage permits and decrees have been issued and it should be noted that as in the case of water works every permit is a decree but every decree is not a permit. These permits and decrees include 46 permits for the temporary discharge of sewage untreated into State waters; 19 approvals of plans for sewage treatment work in addition to 6 approvals of sewage treatment plans contained in temporary permits; 4 decrees rejecting sewerage plans or withholding approval thereof until sewage treatment plans are prepared; one decree rejecting sewage treatment plans or withholding approval because of lack of sufficient detail; and 8 decrees requiring the preparation of sewage treatment plans to be taken up at once. A special permit was issued to the Borough of Washington for petty sewer extensions to its system discharging to the sewage treatment works already approved by the Department. A permit was issued to Washington and East Washington jointly for the connection of the two sewerage systems and the discharge of the sewage of the latter to the sewage disposal plant of the former. The old sewage disposal plant of East Washington was abandoned.

Of the 46 permits for the temporary discharge of sewage untreated into State waters:

Two (2) expire within 3 months and require the submission of sewage disposal plans within that time, namely, those issued to Mt. Union and South Bethlehem, Northampton County.

Seven (7) expire in 6 months, namely, that issued to Monessen which tentatively approves sewage treatment plans, except for the site; also those to Clairton, Hazleton, New Brighton, South Brownsville, Verona, and West Brownsville, which are required to submit sewage treatment plans for approval within the six months.

Nineteen (19) expire within one year, namely, those issued to Portage and the Suburban Drainage Company, which require the submission of sewage disposal plans in 6 months; that issued to Glassport and 12 to Philadelphia, which require the submission of sewage disposal plans in one year; that issued to Bellevue, which requires the submission of sewage disposal plans on order.

Seven (7) expire in two years; that to Meadville tentatively approving sewage treatment plans; those to Crafton and Springdale, requiring the submission of sewage treatment plans in two years. Those to the Erie Improvement Company, Parsons and Plymouth, requiring the submission of sewage treatment plans upon order; and that to West Chester, approving the proposed construction of 2 sewage treatment plants previously passed upon by the Department and granting permission for the temporary discharge of crude sewage from storm overflows of the combined sewerage system pending the revision of said system.

Seven (7) expire in 3 years; those to Danville and New Castle tentatively approving sewage treatment plans; that to Norwood requiring the submission of sewage treatment plans in 3 months; the second permit to Old Forge requiring the submission of sewage treatment plans in 6 months and those to Dorranceton, Throop and Warrior Run, requiring the submission of sewage treatment plans on order.

Four (4) expire in 4 years; that to Renovo tentatively approving sewage treatment plans; two permits to Harrisburg requiring the submission of sewage treatment plans in 4 years and one to the Middletown Drainage Company, requiring the submission of sewage treatment plans in 6 months.

Nineteen (19) permits and decrees approving plans for sewage treatment works were issued to the following:

1. Allegheny County Home and Hospital for the Insane.
2. Bristol.
3. Brittain, A. R., et al.
4. Bethany Orphans' Home.
5. Chambersburg.
6. Goodyear Lumber Company.
7. Home and Hospital of the Good Shepherd.
8. Lebanon.
9. Ligonier, first.
10. Ligonier, second.
11. Ligonier, third, immediate disinfection.
12. Masontown.
13. Nazareth.
14. Palmer Land Company (for extensions).
15. Quakertown.
16. Rumphs, Sons, Frederick.
17. Rush Hospital.
18. Schuylkill County Poor Farm.
19. Valley Camp Association.

Numbers 8, 9, 13 and 15 of the above permits and decrees, require modification of sewage treatment plans to be re-submitted for final approval. The above list is in addition to approvals of sewage treatment plans given in a number of instances in permits for the temporary discharge of crude sewage.

The 4 decrees rejecting or withholding approval of sewer plans were issued to Danville (second permit), Everson, Gilberton and Old Forge (first permit).

The one decree rejecting sewage treatment plans was issued to Ben Avon Heights Sewer Company.

The 8 decrees requiring the preparation at once of plans for sewage treatment works were issued to the East End Sewer Company, the Goodyear Lumber Company (first permit), Meyersdale, Parker, Pittsburgh-Buffalo Company, Summerhill, McKeesport and Zelienople.

The 571 sewerage permits and decrees issued since the creation of the State Department of Health, several to the same place in a number of cases, are listed in the following table. Recipients, which are not municipal corporations, are set in under the city, borough or township in which located; except those which maintain or propose sewerage systems in suburban districts and are set in under the central town, when it also has received a permit or decree. All recipients and all municipalities in which the works are to afford sewerage are also indexed alphabetically.

SEWERAGE PERMITS AND DECREES ISSUED. 1905-1911.

Number of Municipalities.	PLACE.	Number by Years.						
		'05-06	1907	1908	1909	1910	1911	Total
	Summary.	51	86	129	114	111	80	571
1	Aliquippa,	......	2	......	......	1	......	3
	Allegheny City Home, (See O'Hara Township),	......	......	......	......	......	......	......
	Allegheny County Home and Hospital for Insane, (see Collier Township),	......	......	......	......	......	......	......
	Allegheny County Work House, (see O'Hara Township),	......	......	......	......	......	......	......
2	Allentown,	......	......	1	......	......	......	1
	American Steel and Wire Co., (see under Donora),	......	......	......	......	......	......	......
	Aspinwall-Delafield Co., (See O'Hara Township),	......	......	......	......	......	......	......
3	Avoca,	......	......	......	1	......	......	1
4	Baden,	......	1	......	......	......	......	1
5	Baldwin Township,	......	......	......	......	......	......	......
	West Liberty Improvement Co.,	......	......	......	......	1	......	1
6	Barnesboro,	......	......	1	......	......	......	1
7	Bath,	......	......	......	......	1	......	1
8	Beaver,	......	......	1	......	......	......	1
9	Beaver Falls,	......	......	......	1	......	......	1
10	Bedford,	......	1	......	1	......	......	2
	Beechwood Park Amusement Co., (See Haverford Township),	......	......	......	......	......	......	......
11	Bellefonte,	......	......	1	......	......	......	1
12	Bellevernon,	......	......	......	......	1	......	1
13	Bellevue,	......	......	......	1	......	1	2
14	Ben Avon,	......	......	1	......	......	......	1
	Ben Avon Heights Sewer Co., (See Kilbuck Township),	......	......	......	......	......	......	......
	Bethany Orphans Home, (See Heidelberg Township),	......	......	......	......	......	......	......
15	Big Beaver Township,							
	Koppel Land Company,	......	......	......	2	......	......	2
16	Big Run,	......	1	......	......	......	......	1
17	Blairsville,	......	1	......	1	......	......	2
18	Blakely,	1	......	......	1	......	......	2

SEWERAGE PERMITS AND DECREES ISSUED. 1905-1911—Continued.

Number of Municipalities.	PLACE.	Number by Years.						
		'05-06	1907	1908	1909	1910	1911	Total
19	Bloomsburg,	1	......	......	......	......	......	1
20	Brackenridge,	......	......	2	1	......	......	3
21	Braddock Township, (See E. Wilkinsburg Improvement Co.),	......	......	......	......	......	......	......
22	Bradford,	......	......	1	......	......	......	1
23	Bristol,	......	1	......	......	......	1	2
	Brittain, A. R., (See East Stroudsburg),	......	......	......	......	......	......	......
24	Brownsville,	......	......	......	......	1	......	1
	Bryn Athyn (Association), (See Moreland Township),	......	......	......	......	......	......	......
25	Burrell Township, Josephine Furnace and Coke Co.,	......	......	......	......	1	......	1
26	Butler,	......	1	......	......	......	......	1
27	California,	2	......	1	......	......	......	1
28	Cambridge Springs,	......	1	2	1	......	......	4
29	Canonsburg,	......	......	1	......	......	......	1
30	Canton,	......	1	......	......	......	......	1
31	Carbondale,	......	......	......	2	1	......	3
32	Carbondale Township, Mayfield Yards, (Citizens),	......	......	......	......	1	......	1
33	Carlisle,	......	2	......	......	......	......	2
34	Carmichaels,	......	......	......	......	1	......	1
35	Carrick,	1	......	1	......	......	......	2
36	Carroll Township, (see under Donora, Am. Steel and Wire Co.),	......	......	......	......	......	......	......
37	Cecil Township,	......	......	......	......	......	......	......
	Penna. Reform School, (Morganza),	......	......	1	.....	1	......	2
38	Chambersburg,	......	1	......	......	......	1	2
39	Chapman Township, (see under Renovo, Drocton Land Co.),	......	......	......	......	......	......	......
40	Charleroi,	......	......	......	......	1	......	1
41	Chartiers Township,	......	2	......	......	......	......	2
42	Chester,	......	......	1	......	1	......	2
	Chester Springs Soldiers' Orphans School, (See W. Pikeland Township),	......	......	......	......	......	......	......
43	Cheswick,	......	......	3	......	2	......	5
44	Clairton,	......	......	......	......	......	1	1
45	Clearfield,	......	......	......	1	1	......	2
46	Clintonville,	......	......	1	......	......	......	1
47	Coaldale,	......	1	1	......	......	......	2
48	College Hill,	......	......	......	2	......	......	2
49	College Township (see under State College, John Hamilton),	......	......	......	......	......	......	......
50	Collier Township, Allegheny County Home and Hospital for Insane,	......	......	......	......	......	1	1
51	Columbia,	......	1	1	......	......	......	2
52	Columbus Township, Warren County (see Howard Tannery, under Corry),	......	......	......	......	......	......	......
53	Colwyn,	......	......	1	......	1	......	2
54	Conewango Township, Warren Co., (see under Warren, State Hospital for Insane),	......	......	......	......	......	......	......
55	Connellsville,	......	......	1	1	......	......	2
56	Coraopolis,	......	1	......	......	......	......	1
57	Corry, (Erie County),	......	......	1	......	1	......	2
	Howard Tannery, (Columbia Township, Warren County),	......	......	1	......	......	......	1
58	Coudersport,	......	......	......	......	1	......	1
59	Crafton,	......	......	......	......	......	1	1
	Cressman, Philip, (see Perkasie),	......	......	......	......	......	......	......
60	Cresson,	......	1	......	......	......	......	1
61	Danville,	......	......	2	......	1	2	5
	State Hospital for the Insane, (Mahoning Township),	......	......	......	1	......	......	1
62	Darby,	......	......	1	......	1	......	2
	Delmont Land Co., (see Dormont),	......	......	......	......	......	......	......
	Dermady Sanatorium, (See Springfield Township),	......	......	......	......	......	......	......
63	Derry,	......	1	2	......	......	......	3
	Devon (Citizens) (see Easttown Township),	......	......	......	......	......	......	......
64	Dickson City Borough,	......	......	1	......	......	......	1
	Dixmont, W. Penna. Hospital for the Insane, (see Kilbuck Township),	......	......	......	......	......	......	......
65	Donora,	......	......	......	1	......	......	1
	American Steel and Wire Company, (for South Donora, Carroll Township),	......	......	......	......	1	1	......
66	Dormont,	......	......	......	......	......	......	......
	Delmont Land Co.,	......	......	......	1	......	......	1

SEWERAGE PERMITS AND DECREES ISSUED. 1905-1911—Continued.

Number of Municipalities.	PLACE.	Number by Years.						
		'05-06	1907	1908	1909	1910	1911	Total
67	Dorranceton,	......	......	1	......	......	1	2
68	Doylestown,	......	......	......	......	......	......	......
	Doylestown Sewerage Co.,	......	......	......	1	1	......	2
	Drocton Land Co., (see under Renovo),	......	......	......	......	......	......	......
69	DuBois,	......	......	......	1	......	......	1
70	Dunmore,	......	1	......	......	......	......	1
	Dysart, A. P., (see Scott Township),	......	......	......	......	......	......	......
71	Eagles Mere,	......	......	......	1	......	......	1
	Eagleville, (see Lower Providence Township), (Phila. Jew. Sana.),	......	......	......	......	......	......	....
72	East Bethlehem Township,							
	Vesta Coal Company,	......	......	......	......	1	......	1
73	East Brady,	1	......	......	......	......	......	1
	East End Sewer Co., (see Sunbury),	......	......	......	......	......	......	......
74	East McKeesport,	......	1	......	......	......	......	1
75	East Mauch Chunk,	......	1	......	......	......	......	1
76	Easton,	1	......	......	1	2	......	4
77	East Stroudsburg,	......	......	......	1	......	......	1
	Brittain, A. R.,	......	......	......	......	......	1	1
78	Easttown Township, Chester Co.,	......	......	......	......	......	......	......
	Devon, (Citizens),	......	1	......	......	......	......	1
79	East Vincent Township,							
	Eastern Pennsylvania State Institute for Feeble Minded and Epileptic, near Spring City,	1	......	......	......	......	......	1
80	East Washington, (see Washington),	......	......	......	......	......	......	......
	East Wilkinsburg Improvement Co., (Braddock and Wilkins Township),	......	......	......	......	1	......	1
81	Edgeworth,	1	1	......	......	......	......	2
82	Edinboro,	......	1	......	......	......	......	1
83	Edwardsville,	......	......	1	......	......	......	1
	Elkwood Sewerage Co., (see L. Allen Township),	......	......	......	......	......	......	......
84	Ellwood City borough,	......	1	1	......	......	......	2
	Elwyn, Penna. Training School (see Middletown Township),	......	......	......	......	......	......	......
85	Emlenton,	......	......	1	......	......	......	1
86	Emporium,	1	......	......	......	1	......	2
87	Emsworth,	1	......	......	......	......	......	1
88	Erie,	......	......	......	1	1	......	2
	Erie Improvement Co., (Mill Creek and Harbor Creek Townships),	......	......	1	......	......	1	2
89	Etna,	......	......	......	1	......	......	1
90	Everson,	......	......	......	......	......	1	1
91	Exeter,	......	......	1	......	......	......	1
92	Fairchance,	......	......	1	......	......	......	1
	Fair Oaks Land Co., (see Leet Township),	......	......	......	......	......	......	......
93	Ford City borough,	......	2	......	......	......	......	2
94	Forest City,	......	1	1	......	......	......	2
95	Franklin,	......	......	1	1	......	......	2
96	Freeport,	......	......	1	......	......	......	1
97	Gaysport,	1	......	......	......	......	......	1
98	Gilberton,	......	......	......	......	......	1	1
	Girl's Department of the House of Refuge, (see Middletown Township),	......	......	......	......	......	......	......
99	Glassport,	......	......	1	......	1	1	3
	Goodyear Lumber Co., (see Norwich Township),	......	......	......	......	......	......	......
100	Green Tree,	......	......	......	......	1	......	1
101	Greenville,	1	1	......	......	......	......	2
102	Grove City,	......	......	1	1	......	......	2
103	Hallstead,	1	......	......	......	......	......	1
	Hamilton, John, (see under State College),	......	......	......	......	......	......	......
104	Hanover, Hanover Sewer Co.,	......	......	......	1	......	......	1
105	Hanover Township, Lehigh Co.,							
	Homeopathic State Hospital, near Rittersville,	......	......	1	......	......	......	1
106	Harbor Creek Township, (see under Erie Improvement Co.),	......	......	......	......	......	......	......
107	Harrisburg,	1	1	......	2	......	2	6
	Pennsylvania State Lunatic Hospital, (Susquehanna Township),	......	......	......	1	......	......	1
	Suburban Drainage Co., (Susquehanna Township),	......	......	......	1	......	1	2
108	Harrison Township, Natrona Village, Allegheny County,	......	1	......	......	......	......	1
109	Hastings,	......	......	......	1	1	......	2
110	Haverford Township,	......	......	......	......	......	......	......
	Beechwood Park Amusement Co.,	......	......	1	......	......	......	1
	Haverford College,	......	......	1	......	......	......	1

SEWERAGE PERMITS AND DECREES ISSUED. 1905-1911—Continued.

Number of Municipalities.	PLACE.	Number by Years.						
		'05-06	1907	1908	1909	1910	1911	Total
111	Hazleton,	......	......	......	1	1	1	3
112	Heidelberg Township, Berks Co.,							
	Bethany Orphans Home,	......	......	......	......	......	1	1
113	Hollidaysburg,	1	......	......	......	......	......	1
	Home and Hospital of the Good Shepherd, (see Radnor Township),	......	......	......	......	......	......	......
114	Hopewell Township,							
	Jones and Laughlin Steel Company, (for Woodlawn, since incorporated),	......	......	1	......	......	......	1
	House of Refuge, (Girls Department), (see Middletown Township),	......	......	......	......	......	......	......
115	Houtzdale,	......	......	1	......	1	......	2
	Howard Tannery, (see under Corry),	......	......	......	......	......	......	......
116	Hughesville,	......	......	1	......	......	......	1
117	Huntingdon,	......	......	1	......	......	......	1
	Pennsylvania Industrial Reformatory, (Smithfield Township),	......	......	......	1	......	......	1
118	Indiana,	......	2	1	......	......	......	3
119	Jeannette,	......	1	......	1	1	......	3
	Jefferson County Commissioners, (see Pine Creek Township),	......	......	......	......	......	......	......
120	Johnsonburg,	......	2	......	......	......	......	2
	Jones and Laughlin Steel Co., (see Hopewell Township),	......	......	......	......	......	......	......
	Josephine Furnace and Coke Company, (see Burrell Township),	......	......	......	......	......	......	......
121	Kane,	......	3	1	......	......	......	4
122	Kilbuck Township, Allegheny County,							
	Western Pennsylvania Hospital for the Insane, Dixmont,	......	......	......	1	......	......	1
	Ben Avon Heights Sewer Co.,	......	......	......	......	......	1	1
123	Kingston,	1	......	......	......	......	......	1
124	Kittanning,	......	......	1	......	......	......	1
125	Knoxville,	......	......	......	1	......	......	1
	Koppel Land Co., (see Big Beaver Co.),	......	......	......	......	......	......	......
126	Lancaster,	1	3	2	......	1	......	7
127	Lansdowne,	......	......	1	......	1	......	2
128	Lansford,	1	......	......	......	......	......	1
129	Lebanon,	......	......	......	......	......	1	1
130	Leet Township,	......	......	......	......	......	......	......
	Fair Oaks Land Co.,	......	......	1	......	......	......	1
	Lehigh County Commissioners, (see S. Whitehall Township),	......	......	......	......	......	......	......
131	Lehighton,	......	......	......	......	1	......	1
132	Lewisburg,	1	......	......	1	......	......	2
133	Lewistown,	......	......	......	1	......	......	1
134	Ligonier,	1	......	......	......	......	3	4
135	Lower Allen Township, Cumberland Co., Elkwood Sewerage Co.,	......	......	......	......	......	1	1
136	Lower Burrell Township, Westmoreland County, Valley Camp Association,	......	......	......	......	......	1	1
137	Lower Heidelberg Township, Berks Co., State Asylum for Chronic Insane, Wernersville,	......	......	......	1	......	......	1
138	Lower Merion Township,	1	1	......	2	......	......	4
139	Lower Providence Township, Montgomery County, Phila., Jewish Sanatorium at Eagleville,	......	......	......	1	......	......	1
140	Lower Towamensing Township, Carbon County, New Jersey Zinc Co.,	......	1	......	......	......	......	1
	Palmer Land Co.,	......	......	1	......	......	1	2
141	McAdoo,	......	......	......	2	......	......	2
	McClure, H. M., (see Selinsgrove),	......	......	......	......	......	......	......
142	McKeesport,	......	......	3	......	......	1	4
143	Mahoning Township, (see State Hospital under Danville),	......	......	......	......	......	......	......
144	Manorville,	......	......	......	1	......	......	1
145	Mansfield,	......	......	......	......	1	......	1
146	Marianna,	......	......	......	......	......	......	......
	Pittsburgh-Buffalo Co.,	......	......	......	......	......	1	1
147	Marcus Hook,	......	1	......	1	1	......	3
	Markle and Frank, (see Uniontown),	......	......	......	......	......	......	......
148	Mars,	......	......	......	1	2	......	3
149	Masontown,	......	......	......	......	1	1	2
	Mayfield Yards, (see Carbondale Township),	......	......	......	......	......	......	......
150	Meadville,	1	......	......	......	......	1	2
151	Mercer,	......	1	......	......	......	......	1
152	Meyersdale,	......	......	......	......	......	1	1

SEWERAGE PERMITS AND DECREES ISSUED. 1905-1911—Continued.

Number of Municipalities.	PLACE.	Number by Years.						
		'05-06	1907	1908	1909	1910	1911	Total
153	Middletown, Dauphin Co.,	......	......	......	......	......	......	......
	Middletown Drainage Co.,	......	......	1	......	......	1	2
154	Middletown Township, Bucks Co.,	......	......	......	......	......	......	......
	Rumpfs Sons, Frederick,	......	......	......	......	......	1	1
155	Middletown Township, Delaware County,							
	Girls Department of House of Refuge, Darling,	......	......	1	......	......	......	1
	Penna. Training School for Feeble Minded Children, Elwyn,	......	......	1	......	1	......	2
	Williamson Free School of Mechanical Trades,	......	......	1	......	......	......	1
156	Mill Creek Township, (see Erie, Erie Imp. Company),	......	......	......	......	......	......	......
157	Millvale,	......	......	......	......	1	......	1
158	Millville,	......	......	......	1	......	......	1
159	Milton,	1	......	......	1	......	......	2
160	Miners Mills,	......	......	......	1	......	......	1
161	Minersville,	......	......	1	......	......	......	1
162	Monaca,	......	......	1	......	......	......	1
163	Monessen,	......	......	......	1	1	1	3
164	Mongomery,	......	......	1	......	......	......	1
165	Moreland Township,	......	......	......	......	......	......	......
	Bryn Athyn Village Association,	......	......	2	......	......	......	2
	Morganza, Penna. Reform School, (see Cecil Township),	......	......	......	......	......	......	......
166	Mt. Carmel,	1	......	1	......	......	......	2
	Mt. Gretna (see S. Londonderry Township)	......	......	......	......	......	......	......
167	Mt. Oliver,	......	......	......	1	......	......	1
168	Mt. Pleasant,	......	......	......	2	1	......	3
169	Mt. Union,	......	......	1	......	......	1	2
170	Nanticoke,	......	......	......	1	......	......	1
171	Narberth,	......	1	......	......	......	......	1
	Natrona village, (see Harrison Township, Allegheny County),	......	......	......	......	......	......	......
172	Nazareth,	......	......	......	......	......	1	1
173	New Brighton,	......	......	......	......	......	1	1
174	New Castle,	2	2	1	......	1	1	7
175	New Cumberland,	......	......	......	......	......	1	1
	New Jersey Zinc Co., (see L. Towamensing Township),	......	......	......	......	......	......	......
176	New Kensington,	......	......	1	1	......	......	2
177	New Oxford,	......	......	......	......	......	......	......
	New Oxford Drainage Co.,	......	1	......	......	......	......	1
178	Newport,	......	2	......	......	......	......	2
179	New Wilmington,	......	......	2	1	......	......	3
180	Norristown,	......	......	......	......	......	......	......
	State Hospital for Insane of the S. E. Dist.,	......	......	......	1	1	......	2
181	North Braddock,	......	......	......	1	2	......	3
182	North Charleroi	......	......	......	......	1	......	1
183	North East,	......	......	......	1	......	......	1
184	North Manheim Township,							
	Schuylkill Co. Poor Farm,	......	......	......	......	......	1	1
185	Northumberland,	1	......	......	1	......	......	2
186	Norwich Township, McKean Co.,							
	Goodyear Lumber Co.,	......	......	......	......	......	2	2
187	Norwood,	......	......	......	......	......	1	1
188	Oakmont,	......	1	......	......	......	......	1
189	O'Hara Township,	......	......	......	......	......	......	......
	Allegheny City Home,	......	1	1	......	......	......	2
	Allegheny County Work House,	......	1	......	......	......	......	1
	Aspinwall-Delafield Co.,	1	......	......	......	......	......	1
190	Oil City,	1	......	......	2	......	......	3
191	Old Forge,	......	......	......	......	......	2	2
192	Olyphant,	......	......	1	2	1	......	4
193	Osborne,	1	2	......	1	1	......	5
194	Palmer Land Co., (see Lower Towamensing Township),	......	......	......	......	......	......	......
194	Parker,	......	......	......	......	......	1	1
195	Parnassus,	......	......	1	......	......	......	1
196	Parsons,	......	......	......	......	1	1	2
197	Patterson Heights,	......	......	......	1	......	......	1
	Penna. Glue Co., (see Springdale borough)	......	......	......	......	......	......	......
	Penna. Training School or Feeble Minded Children, (see Middletwn Township),	......	......	......	......	......	......	......
198	Perkasie,							
	Philip Cressman,	......	......	......	3	......	......	3
199	Petersburg,	......	......	......	......	1	......	1
200	Philadelphia,	......	8	8	14	15	12	57
	Philadelphia Jewish Sanatorium, (Eagleville), (See L. Providence Township),	......	......	......	......	......	......	......

SEWERAGE PERMITS AND DECREES ISSUED. 1905-1911—Continued.

Number of Municipalities.	PLACE.	Number by Years.						
		'05-06	1907	1908	1909	1910	1911	Total
201	Pine Creek Township,							
	Jefferson County Commissioners,					1		1
202	Pitcairn,		1		1	1		3
203	Pittsburgh,					4		4
	Pittsburgh Filter Plant,		1					1
	Pittsburgh-Buffalo Co., (see Marianna),							
204	Pleasantville,					1		1
205	Plymouth,						1	1
206	Polk,							
	State Institution for Feeble Minded,		1			1		2
207	Portage,						1	1
208	Pottsville,			1	1			2
	Yorkville, annexed to Pottsville,		1					1
209	Punxsutawney,				1	1		2
210	Quakertown,						1	1
211	Radnor Township, Delaware County,							
	Wayne Sewerage Co.,	1						1
	Home and Hospital of the Good Shepherd,						1	1
212	Reading,			3				3
213	Renovo,				1		1	2
	Drocton Land Co., (Chapman Township),	1						1
214	Reynoldsville,			1				1
215	Ridgway,			1				1
216	Ridley Park,			1				1
	Rittersville, (see Hanover Township)							
	Homeopathic State Hospital for Insane,							
217	Rochester,					1		1
	Rumpfs Sons, Frederick, (see Middletown Township),							
	Rush Hospital, (see Willistown Township),							
218	St. Clair, Allegheny Co.,				1			1
219	St. Clair, Schuylkill Co.,			1				1
220	St. Marys,		1					1
221	Saltsburg,		1					1
222	Sayre,	1			1			2
223	Scalp Level,		1	2				3
	Schuylkill County Poor Farm, (see North Manheim Township),							
224	Schuylkill Haven,					1		1
225	Scottdale,			1	1			2
226	Scott Township, Allegheny County, Delmont Land Co., (annexed in 1909 to Dormont, q. v.),							
	Dysart, A. P.,			1				1
227	Selinsgrove,							
	McClure, H. M.,	2						2
228	Sewickley,			1	1			2
229	Shaler Township,		1					1
230	Sharon,			1				1
231	Sharon Hill,	1		1				2
232	Sharpsville,			1		1		2
233	Shenandoah,			1				1
234	Shinglehouse,					1		1
235	Siverly,				1			1
236	Slippery Rock,				1			1
237	Smethport,				1			1
238	Smithfield Township, (see under Huntingdon, Penna. Ind. Reformatory),							
239	Somerset,					1		1
240	South Bethlehem, Armstrong County,				1			1
241	South Bethlehem, Northampton Co.,	1				2	1	4
242	South Brownsville,					1	1	2
243	South Canonsburg,			2				2
244	South Fork,					3		3
245	South Londonderry Township, Mt. Gretna Park,					2		2
246	South Sharon,			1				1
247	S. Whitehall Township,							
	Lehigh County commissioners,					1		1
	Spring City, (East. Penna. State Institute for Feeble Minded and Epileptic, see E. Vincent Township),							
248	Springdale borough, (Inc. Oct. 17, 1906 from part Springdale Township),						1	1
	Penna. Glue Co. (decree June 20, 1906),	1						1
249	Springfield Township, Delaware Co.,							
	Dermady Sanatorium,	1						1
250	State College Borough,							
	Pennsylvania State College,					1		1
	John Hamilton, (College Township),				1			1

SEWERAGE PERMITS AND DECREES ISSUED. 1905-1911—Continued.

Number of Municipalities.	PLACE.	Number by Years.						
		'05-06	1907	1908	1909	1910	1911	Total
	STATE INSTITUTIONS:							
	Chester Springs Soldiers' Orphans School, (see West Pikeland Township),	......	......	......	......	......	......	......
	E. Penna. State Institute for the Feeble Minded and Epileptic, (near Spring City, see E. Vincent Township),	......	......	......	......	......	......	......
	Homeopathic State Hospital for the Insane, (Rittersville, see Hanover Township),	......	......	......	......	......	......	......
	Penna. Ind. Reformatory, (see under Huntingdon),	......	......	......	......	......	......	......
	Penna. Reform School, (Morganza, see Cecil Township),	......	......	......	......	......	......	......
	Penna. State College, (see State College)	......	......	......	......	......	......	......
	Penna. State Lunatic Hospital at Harrisburg, (see under Harrisburg),	......	......	......	......	......	......	......
	State Asylum for the Chronic Insane of Pennsylvania, (Wernersville, see Heidelberg Township),	......	......	......	......	......	......	......
	State Hospital for the Insane at Danville), (see under Danville),	......	......	......	......	......	......	......
	State Hospital for the Insane at Warren, (see under Warren),	......	......	......	......	......	......	......
	State Hospital for the Insane of the S. E. District, (see Norristown),	......	......	......	......	......	......	......
	State Institute for Feeble Minded, (see Polk),	......	......	......	......	......	......	......
251	Stoystown,	1	......	......	......	......	......	1
252	Stroudsburg,	......	......	1	......	......	......	1
	Suburban Drainage Co., (see under Harrisburg),	......	......	......	......	......	......	......
253	Summerhill,	......	......	......	......	......	1	1
254	Summit Hill,	......	1	1	......	1	......	3
255	Sunbury,	......	......	......	......	......	......	......
	East End Sewer Co.,	1	......	......	......	......	1	2
	Susquehanna Sewer Co.,	1	......	......	......	......	......	1
	Third Ward Sewer Co.,	1	......	......	......	......	......	1
256	Susquehanna Depot,	1	......	......	1	1	......	3
	Susquehanna Sewer Co., (see Sunbury), ..	......	......	......	......	......	......	......
257	Susquehanna Township, (see State Hospital and Suburban Drainage Co., under Harrisburg),	......	......	......	......	......	......	......
258	Swarthmore,	......	......	1	1	......	......	2
259	Tarentum,	......	......	1	2	......	......	3
260	Taylor,	......	1	......	1	......	......	2
261	Taylor Township, Lawrence County, West Pittsburgh Realty Co.,	......	......	......	1	1	......	2
	Third Ward Sewer Co., (see Sunbury), ..	......	......	......	......	......	......	......
262	Throop,	......	......	......	......	......	1	1
263	Titusville,	1	1	......	......	......	......	2
264	Towanda,	......	......	......	......	1	......	1
	Trevorton Sewerage Co., (see Zerbe Township),	......	......	......	......	......	......	......
265	Tyrone,	......	......	......	......	1	......	1
266	Union City borough,	......	......	1	......	......	......	1
266	Uniontown,	......	......	......	2	1	......	3
	Markle and Frank,	......	......	......	1	......	......	1
268	Upland,	......	......	1	......	1	......	2
	Valley Camp Association, (see L. Burrell Township),	......	......	......	......	......	......	......
269	Verona,	......	1	1	......	......	1	3
270	Versailles,	......	1	......	......	......	......	1
	Vesta Coal Co., (see E. Bethlehem Township),	......	......	......	......	......	......	......
271	Wall,	......	1	......	......	......	......	1
272	Warren,	1	1	......	1	1	......	4
	State Hospital for the Insane, (Conewango Township),	......	1	......	......	......	......	1
273	Warrior Run,	......	......	......	......	......	1	1
274	Washington, (see below),	......	1	......	1	1	1	4
	Washington and E. Washington,	......	......	......	......	......	1	1
275	Watsontown,	......	......	1	......	......	......	1
	Wayne Sewerage Co., (see Radnor Township),	......	......	......	......	......	......	......
276	Wellsboro,	1	......	1	......	......	......	2
	Wernersville, (State Asylum for Chronic Insane, (see L. Heidelberg Township), .	......	......	......	......	......	......	......
277	West Brownsville,	......	......	......	1	......	1	2
278	West Chester,	1	......	......	......	1	1	3

SEWERAGE PERMITS AND DECREES ISSUED. 1905-1911—Continued.

Number of Municipalities.	PLACE.	Number by Years.						
		'05-06	1907	1908	1909	1910	1911	Total
279	West End,	......	......	......	1	......	......	1
280	West Hazleton,	......	......	......	1	......	......	1
	West Liberty Improvement Co., (see Baldwin Township),	......	......	......	......	......	......	......
281	West Middlesex,	1	......	......	......	......	......	1
282	West Newton,	......	......	......	1	1	......	2
283	West Pikeland Township,							
	Chester Springs Soldiers' Orphans School,	......	......	......	1	......	......	1
	West Pittsburgh Realty Co., (see Taylor Township),	......	......	......	......	......	......	......
284	West Reynoldsville	......	......	1	......	......	......	1
285	West View,	......	......	......	1	......	1	2
286	White Haven,	......	......	1	......	......	......	1
287	Wickboro,	......	......	1	......	......	......	1
288	Wilkinsburg,	......	......	......	......	1	......	1
289	Wilkins Township, (see E. Wilkinsburg Improvement Co.,	......	......	......	......	......	......	......
	Williamson Free School of Mechanical Trades, (see Middletown Township),	......	......	......	......	......	......	......
290	Williamsport,	......	2	......	......	......	......	2
291	Willistown Township, Chester Co.,							
	Rush Hospital, (Country Branch),	......	......	......	......	......	1	1
292	Winton,	......	......	1	......	......	......	1
293	Wyoming,	......	1	......	......	1	......	2
294	Yeadon,	......	......	1	......	1	......	2
295	York,	1	1	......	......	......	......	2
296	Yorkville,	......	......	......	......	......	......	......
	Annexed in 1907 to Pottsville q. v.,	......	......	......	......	......	......	......
297	Youngsville,	1	......	......	......	......	......	1
298	Youngwood,	......	......	1	......	......	......	1
299	Zelienople,	1	......	1	......	......	1	3
300	Zerbe Township, Northumberland Co.,	......	......	......	......	......	......	......
	Trevorton Sewerage Co.,	......	......	1	......	......	......	1
	Total,	51	86	129	114	111	80	571

Before the State undertook the administration of the law compelling corporations to submit their sewerage plans to the Commissioner of Health for approval, hap-hazard methods of building sewers regardless of system were in vogue quite generally throughout the Commonwealth. Now this has been changed. Some idea of the value of the engineering work of the Department may be obtained from considering the fact that at the present time 137 public or private corporations have prepared comprehensive plans for sewerage which this Department has ordered and has approved, and sewers extended by these places from year to year are laid in conformity with these plans. The State could not be a party to a plan for desultory additions to existing sewers, regardless of system. It needed only the initiatory action of the State to show the local authorities the wisdom of proceeding according to this plan. In the following tables are given the names of the 137 places where comprehensive plans have been prepared and approved and the sewers are now being built in conformity therewith:

Aliquippa
Allentown
Aspinwall-Delafield Company
Avoca
Baden
Beaver
Bedford
Bellevue
Ben Avon
Blakely

Brackenridge
Bristol
Cambridge Springs
Canonsburg
Carlisle
Carmichaels
Carrick
Chambersburg
Chester
Cheswick
Coaldale
Columbia
Colwyn
Coudersport
Cressman, Philip, (Perkasie)
Cresson
Danville
Darby
Derry
Dickson City
Delmont Land Company
Dormont
Dorranceton
Doylestown Sewerage Company
Drocton Land Company
Dunmore
Dysart, A. P. (Scott Twp.)
Eagles Mere
East Brady
East Mauch Chunk
Easton
East Wilkinsburg
Edwardsville
Ellwood City
Emlenton
Emsworth
Erie
Erie Improvement Company
Fair Oaks Land Company
Forest City
Goodyear Lumber Company
Green Tree
Greenville
Grove City
Hamilton, John, (College Twp.)
Harrisburg
Hastings
Houtzdale
Jones & Laughlin Steel Company
Indiana
Jeannette
Kane
Kingston
Koppel Land Company
Lancaster
Lansdowne
Lehighton
Lewisburg
Lewistown
Ligonier
Lower Merion Township
McAdoo
Marcus Hook
Mars
Masontown
Mayfield Yards
Mercer
Millvale
Milton
Miners Mills
Monessen
Mt. Carmel
Mt. Gretna Park
Mt. Oliver
Mt. Pleasant
Mt. Union
Narberth
Nazareth
New Castle
Newport
New Wilmington
North East
Olyphant
Osborne
Palmer Land Company
Parsons
Portage
Quakertown
Reading
Renovo
Ridgway
St. Clair, Allegheny County
St. Marys
Sayre
Scott Township
Sewickley
Shaler Township
Sharon Hill
Sharpsville
Siverly
Somerset
South Canonsburg
Springdale
Summit Hill
Susquehanna Depot
Swarthmore
Tarentum
Throop
Upland
Vesta Coal Company
Wall
Warren
Washington
Watsontown
Wayne Sewerage Company
West Chester
West End
West Hazelton
West Liberty Improvement Company
West Newton
West Pittsburgh Realty Company
West View
Wilkinsburg
Winton
Wyoming
Yeadon
York

In 46 places sewage treatment works have been built or are in progress of erection in accordance with plans passed upon in permits and decrees issued by the State Department of Health. They are as follows:

1. Allegheny City Home, O'Hara Township.
2. Allegheny County Home, Collier Township.
3. Allegheny County Work House, O'Hara Township.
4. Bethany Orphans Home (Heidelberg Twp., Berks County).
5. Bryn Athyn Village Association, Moreland Twp., Montgomery Co.
6. Chambersburg.

7. Chester Springs Soldiers' Orhans School (W. Pikeland Twp., Chester Co.)
8. Dermady Sanatorium, Springfield Twp., Delaware County.
9. Derry.
10. Doylestown Sewerage Company.
11. Eastern Penna. State Inst. for the Feeble Minded and Epileptic, near Spring City.
12. East Stroudsburg (A. R. Brittain et al.)
13. Goodyear Lumber Company, Norwich Twp., McKean County.
14. Haverford College.
15. Home and Hospital of the Good Shepherd, Rosemont.
16. Homeopathic State Hospital for the Insane, Rittersville.
17. House of Refuge, Girls Dept., Darlington.
18. Howard Tannery, near Corry.
19. Indiana.
20. Lehigh County Commissioners, South Whitehall Twp.
21. Ligonier.
22. Mt. Gretna Park.
23. New Jersey Zinc Company, Palmerton.
24. Palmer Land Company, Palmerton.
25. Pennsylvania Glue Company, Springdale.
26. Pennsylvania Industrial Reformatory, near Huntingdon.
27. Pennsylvania Reform School Morganza.
28. Pennsylvania State Lunatic Hospital, near Harrisburg.
29. Perkasie (Philip Cressman, proprietor).
30. Philadelphia (Pennypack Creek District).
31. Philadelphia Jewish Sanatorium, Eaglesville.
32. Pittsburgh Filter Plant.
33. Reading.
34. Schuylkill County Poor Farm, North Manheim Twp.
35. State Asylum for the Chronic Insane, Wernersville.
36. State Hospital for the Insane, near Danville.
37. State Hospital for the Insane, Norristown.
38. State Institution for the Feeble Minded of Western Pennsylvania, Polk.
39. Rumpfs Sons, Frederick, Middletown Twp., Bucks County, (trade wastes.)
40. Rush Hospital, near Malvern.
41. Valley Camp Association, Lower Burrell Twp., Westmoreland Co.
42. Washington.
43. Wayne Sewerage Company, Wayne.
44. West Chester (2 plants).
45. Western Penna. Hospital for the Insane, Dixmont.
46. Williamson Free School of Mechanical Trade, Middletown Township, Delaware County.

In 46 cases plans for sewage treatment works have been submitted to and either finally or tentatively approved by the State Department of Health but no construction work has been done up to the present time. These places are as follows:

1. Allentown.
2. Beechwood Park Amusement Co.
3. Bristol.
4. *Canonsburg.
5. Carlisle.
6. Carmichaels.
7. Chester.
8. **Colwyn.
9. Danville.
10. **Darby.
11. Easton.
12. Easttown Twp., Chester Co. (Devon Citizens).
13. Ellwood City.
14. Erie.
15. Greenville.
16. Grove City.
17. Houtzdale.
18. Jefferson County Commissioners, (Pine Creek Twp.)
19. **Lansdowne.
20. Lebanon.
21. Lehighton.
22. Marcus Hook (pumping plant).
23. Mars.
24. Masontown.
25. Meadville.
26. Milton.
27. Monessen.
28. Mt. Carmel.
29. Nazareth.
30. New Castle.
31. New Oxford Drainage Co.
32. Newport.
33. Penna. Training School for Feeble Minded Children, Elwyn.
34. Quakertown.
35. Renovo.
36. St. Marys.
37. Sewickley.
38. Sharpsville.
39. *South Canonsburg.
40. Susquehanna Depot.
41. Swarthmore.
42. Tarentum.
43. West Pittsburgh Realty Co.
44. West View.
45. **Yeadon.
46. York.

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* Joint Scheme. ** Tentative joint scheme for four places.

The reason that most of the above places have as yet undertaken no construction work is that they have permits which have not yet expired for the temporary discharge of crude sewage into State waters, as listed in later tables. A number of others of the above places are small communities which have as yet no sewers but have prepared sewage disposal plans in advance. A few are delinquent and are illegally discharging sewage.

There are 4 municipalities of the above list which have held popular elections to authorize the increase of municipal indebtedness to defray the cost of sewerage and sewage treatment works where the proposition was voted down, namely:

Allentown.
Easton.
York.
Ligonier.

There are 8 places which have not accepted the terms of permits issued to them, namely:

Bloomsburg.
Clintonville.
East Brady.
East Mauch Chunk.
Edgeworth.
Wall
West Middlesex.
Yorkville.

There are 58 places which have received decrees requiring the discontinuance of the discharge of sewage or withholding permission to increase this discharge, into State waters. These places are as follows:

1. Beaver Falls.
2. Bellefonte.
3. Ben Avon Heights Sewer Co.
4. Big Run.
5. Canton.
6. College Hill.
7. Coudersport.
8. Dormont.
9. East End Sewer Co. (Sunbury).
10. East Stroudsburg.
11. Edinboro.
12. Emporium.
13. Everson.
14. Gilberton.
15. Green Tree.
16. Hallstead.
17. Hanover Sewer Company.
18. Harrison Twp., Allegheny Co.
19. Jeannette.
20. Josephine Furnace & Coke Co.
21. Knoxville.
22. Koppel Land Company.
23. McKeesport.
24. Mansfield..
25. Markle & Frank (Uniontown).
26. Meyersdale.
27. Millville.
28. New Kensington.
29. North Charleroi.
30. North East.
31. Parker.
32. Parnassus.
33. Patterson Heights.
34. Petersburg.
35. Pittsburgh-Buffalo Co. (Marianna)
36. Pleasantville.
37. Pottsville.
38. Ridley Park.
39. Rochester.
40. St. Clair, Schuylkill Co.
41. Schuylkill Haven.
42. Shaler Twp. Allegheny Co.
43. Sharon.
44. Shenandoah.
45. Slippery Rock.
46. Somerset.
47. South Sharon.
48. State Hospital for Insane (near
49. Summerhill.
50. Trevorton Sewerage Co.
51. Tyrone.
52. Upland.
53. Versailles.
54. Vesta Coal Company.
55. West Newton.
56. West Reynoldsville.
57. White Haven.
58. Zelienople.

To 15 places, as listed below, permits have been issued for the discharge of sewage into State waters temporarily but without a date being set for the expiration of this permission. The sewage may have to be treated at any time.

Aspinwall-Delafield Company.
Canonsburg.
Donora.
Dunmore.
Dysart, A. P. (Scott Twp.)
East Wilkinsburg Improvement Company

Fairchance.
Lower Merion Township.
McClure, H. M. (Selinsgrove).
Minersville.
Narberth.
Sharon Hill.
South Canonsburg.
Uniontown.
Wellsboro.

The Aspinwall-Delafield Company discharges sewage into the Aspinwall borough sewer system and it is stipulated that whenever sewage treatment is required of the borough the same requirement will be made of the company. Canonsburg and South Canonsburg have had a joint sewage treatment scheme approved by the Department which is to be installed as soon as practicable. Dunmore discharges sewage into the sewers of Scranton and will be required to take up the question of sewage treatment when the latter place is so required. The East Wilkinsburg Improvement Company discharges sewage into the sewers of North Braddock which, under the terms of a local agreement, is responsible for the treatment of the sewage when this becomes necessary. The sewers of Lower Merion Township and, through them, the sewers of Narberth discharge into the sewerage system of Philadelphia. The sewer system installed by A. P. Dysart has been taken over by Scott Township and is subject to the requirements made upon this township. Donora, Fairchance, Minersville, H .M. McClure, (who maintains a sewer system for Selinsgrove), Sharon Hill and Uniontown will be required to take up the question of the treatment of sewage when it is practicable for the matter to be taken up on a general way with all the places in these respective sections. The sewage from many of these places goes into streams grossly polluted with acid mine drainage, so that there is not need at the present time for more than the preparation of comprehensive plans for the collection of sewage and its conveyance to a suitable site for a future sewage treatment plant. Wellsboro is not able at present to assume the financial obligations necessary for sewage treatment works; only a few much needed specific extensions have been approved and a permit for further extensions has been withheld.

In the following table are given the dates of expiration of permits issued to various places for the temporary discharge of untreated sewage into the waters of the State.

Place.	Year of Expiration.			
	1912	1913	1914	1915
1. American Steel and Wire Company,	X	....	....	....
2. Avoca,	X	....	....	....
3. Bedford,	X	....	....	....
4. Bellevue,	X	....	....	....
5. Blakely,	X	....	....	....
6. Chester,	....	X	....	....
7. Cheswick,	X	....	....	....
8. Clairton,	X	....	....	....
9. Columbia,	X	....	....	....
10. Crafton,	....	X	....	....
11. Danville,	....	....	X	....
12. Dorranceton,	....	....	X	....
13. Elkwood Sewerage Company,	X	....	....	....
14. Erie,	X	....	....	....
15. Erie Improvement Company,	....	X	....	....
16. Glassport,	X	....	....	....
17. Hamilton, John (College twp.),	X	....	....	....
18. Harrisburg,	....	....	....	X
19. Hastings,	....	X	....	....
20. Hazleton,	X	....	....	....
21. Lewisburg,	X	....	....	....
22. McAdoo,	X	....	....	....
23. Manorville,	X	....	....	....

Place.	Year of Expiration.			
	1912	1913	1914	1915
24. Marcus Hook,	X			
25. Mayfield Yards, Citizens (Carbondale twp.),	X			
26. Meadville,		X		
27. Middletown Drainage Company,				X
28. Milton,	X			
29. Miners Mills,	X			
30. Monessen,	X			
31. Mt. Pleasant,	X			
32. New Brighton,	X			
33. New Castle,			X	
34. New Cumberland,	X			
35. Northumberland,	X			
36. Norwood,		X		
37. Old Forge,			X	
38. Olyphant,	X			
39. Parsons,		X		
40. Pennsylvania State College,	X			
41. Philadelphia,	X			
42. Plymouth,		X		
43. Portage,	X			
44. Renovo,				X
45. Sayre,		X		
46. Sewickley,	X			
47. Sharpsville,	X			
48. South Brownsville,	X			
49. Springdale,	X			
50. Suburban Drainage Company,	X			
51. Susquehanna Depot,	X			
52. Throop,			X	
53. Towanda,		X		
54. Verona,	X			
55. Warrior Run,			X	
56. West Brownsville,	X			
57. West Chester,		X		
58. West View,	X			
59. Wyoming,	X			

One hundred and ten permits to discharge sewage into the waters of the State cease on or before the 31st day of December, 1911; the names of the places are given in the following statement. There are various reasons why the sewage from these places should be permitted to discharge into the natural water courses for a while longer. In some instances towns do not have sufficient borrowing capacity at present to enable them to undertake the erection of sewage works. If the proposed amendment to the constitution, now under consideration, to extend the municipal debt limit from seven per cent. of the assessed valuation, which is the present law, to ten per cent. of the assessed valuation, should be approved, a number of towns not able financially to make the improvements now will then be in a position to do so. A number have applications pending for extensions of time.

Aliquippa.
Baden.
Barnesboro.
Bath.
Beaver.
Belle Vernon.
Ben Avon.
Blairsville.
Brackenridge.
Bradford.
Brownsville.
Butler.
California.
Cambridge Springs.
Carbondale.
Carrick.
Charleroi.
Chartiers Township.
Clearfield.
Coaldale.
Colwyn.
Connellsville.
Coraopolis.
Corry.
Cresson.
Darby.
Delmont Land Company.
Dickson City.
Drocton Land Company.
DuBois.
Eagles Mere.
East McKeesport.

Edwardsville.
Emlenton.
Emsworth.
Etna.
Exeter.
Fair Oaks Land Company.
Ford City.
Forest City.
Franklin.
Freeport.
Gaysport.
Grove City.
Holidaysburg.
Hughesville.
Huntingdon.
Johnsonburg.
Jones & Laughlin Steel Company.
Kane.
Kingston.
Kittanning.
Lancaster.
Lansdowne.
Lansford.
Lewistown.
Mercer.
Millvale.
Monaca.
Montgomery.
Mt. Carmel.
Mt. Oliver.
Mt. Union.
Nanticoke.
Newport.
New Wilmington.
North Braddock.
Oakmont.
Oil City.
Osborne.
Pitcairn.
Pittsburgh.
Punxsutawney.
Reynoldsville.
Ridgway.
St. Clair. Allegheny Co.
St. Marys.
Saltsburg.
Scalp Level.
Scottdale.
Scott Township.
Shingle House.
Siverly.
Smethport.
South Bethlehem, Armstrong Co.
South Bethlehem, Northampton Co.
South Fork.
Stoystown.
Stroudsburg.
Summit Hill.
Susquehanna Sewer Company.
Swarthmore.
Tarentum.
Taylor.
Third Ward Sewer Company.
Titusville.
Union City.
Warren.
Watsontown.
West End.
West Hazelton.
West Liberty Improvement Company.
West Pittsburgh Realty Company.
Wickboro.
Wilkinsburg.
Williamsport.
Winton.
Yeadon.
Youngsville.
Youngwood.

15. DESIGN AND CONSTRUCTION SECTION.

The Engineering Division during the year has performed certain work at the Pennsylvania State South Mountain Sanatorium for Tuberculosis near Mont Alto, at the site of the Pennsylvania State Sanatorium for Tuberculosis near Cresson, Cambria County, and at the site of the Hamburg State Sanatorium near Hamburg, Berks County, also at the State Institution for Feeble Minded of Western Pennsylvania near Polk, Venango County, all of which is explained in the following pages.

A—PENNSYLVANIA STATE SOUTH MOUNTAIN SANATORIUM.

The work at this institution has consisted mainly in the continuation of contract work started during 1910 and in the extensions of water supply and sewerage systems made necessary by the erection of new buildings together with studies of future construction necessary to supply the sanitary needs of the institution. The maintenance of the sewage disposal plant, garbage incinerating plant and water works system has been under the supervision of this division.

Sewerage System.

The sewerage system at present consists of terra cotta sewers between all the main buildings at the upper camp and the infirmary building which join near the ice pond and continuing thence along Rocky Mountain Run to the sewage disposal plant in the extreme northeastern part of the sanatorium property. This plant as originally installed consisted of two settling tanks, two sprinkling filter units, two sand filter units and a chemical dosing plant with sludge bed. The tanks were designed for an average flow of 18,000 gallons but this increased very rapidly until the plant was overtaxed and it was necessary in 1909 to add two more settling tanks, giving a total capacity of 50,000 gallons. After this addition the plant was designed at normal rates, to handle 40,000 gallons of sewage a day which would give a detention in the settling tanks of 30 hours while the sprinkling filters would be operating at two million gallons to the acre daily and the sand filters at the rate of 225,000 gallons to the acre daily. The detention in the settling basin under the chemical dosing house would be 35 minutes. However, the sewage flow has greatly exceeded these figures and the effluent from the plant was not satisfactory so that it was necessary in the spring of 1910 to divide the effluent from the settling tanks and pass one half through the sand filters instead of passing the entire amount through both. This method also was unsatisfactory; the sand filters clogged quickly because of the large amount of solids in the septic tank effluent, greatly increasing the operating cost and reducing the bacterial purity of the final effluent. It was found that the purification was accomplished by the chemical treatment rather than by general treatment in the various units of the plant.

The system as outlined above cost as follows:

Main sewers,	$9,985 56
Repairs to sewers,	281 58
Disposal plant,	6,660 26
Operating device,	450 00
Sand filters,	3,535 95
Hauling sand for sand filters,	2,466 33
Additional tanks (day labor) and underdraining main sewer,	3,314 02
Total,	$26,693 70

As before stated the plant was designed for a daily flow of 18,000 gallons of sewage from 300 persons at 60 gallons per capita but it was found when the plant was put into operation that the average flow was 30,000 gallons a day with a maximum rate of 60,000 gallons. The laundry, which started to operate in March, 1909, greatly increased this flow as did an additional number of patients admitted so that during the summer of 1909 the plant was forced to handle a flow based upon a water consumption of 63,000 gallons a day. Leakage in the outfall sewer between the ice pond and the disposal plant greatly increased the burden, sometimes amounting to as much as 200,000 gallons a day. On April 14, 1909, owing to flood conditions this leakage reached 400,000 gallons per day. In order to reduce this leakage 2,100 feet of the main sewer was underdrained by 6 inch open joint terra cotta pipe laid on the bottom of the sewer trench.

On January 10, 1911, the total population of the institution was about 1,000 persons and the water consumption based on an average of the months from February to September 1910 was 72,000 gallons daily. Gaugings of the sewage flow indicate that the daily flow was about 80,000 gallons and the nightly flow about 18,000 gallons, the latter between midnight and morning, being almost entirely ground water leakage. From gaugings taken during November 1910 it is estimated that the plant at the beginning of the year was handling 90,000 gallons daily. This rate during the period of service was shown by gaugings to average about 135,000 gallons a day. Assuming that this flow passes first through the tank, then the sprinkling filters, then the sand filters, the rates through these units would be 9½ hours detention in tanks, 6,750,000 gallons to the acre for 24 hours in sprinkling filters and 742,000 gallons an acre for 24 hours on the sand fillters. This shows that the sprinkling filters and sand filters were being operated at over three times their proper capacity.

It was proposed early in 1911 to extend the sewage disposal plant sufficiently to take care of the total flow from the institution. It was found that the water consumption was about 75 gallons per capita a day, which with an increased population necessarily to be reckoned with, would make a total consumption of 87,000 gallons which would probably mean an average rate of flow of 150,000 gallons a day, assuming that the present ground water leakage is not reduced. On this basis the sprinkling filters operating at a rate of 2,000,000 gallons an acre each day should have a total area of 0.75 of an acre which would necessitate installing three additional pairs of units of the same size as at present being used, which it is estimated would cost $5,000.

The sand filters to care for the above flow at the rate of 225,000 gallons an acre each day should have a total area of .67 of an acre which would mean an additional installation of 21,000 square feet of filter surface. Based on the previous sand filter costs, this new installation would cost $20,800. Since this sewage effluent is sterilized by the use of hypochlorite of lime at a comparatively small cost it was considered to be possible to secure the proper effluent by increasing the sprinkling filters as outlined and that the sand filters could be safely operated at a rate of 350,000 gallons to the acre daily which would only necessitate a part of the sand filter installation, costing $7,500.

It was further believed advisable to construct a resettling basin of 835 cubic feet capacity at an estimated cost of $290.00. It was found that the detention in the basin under the disinfection house was only ten minutes, which was not sufficient time to allow the chemical to thoroughly disinfect the sewage.

It was furthermore considered advisable because of repeated clogging of the sewers in several instances, necessitating digging up the pipes for quite a distance, to locate the obstruction, to install five additional manholes, reducing the distance between manholes to about 200 feet. The estimated cost of this work was $325. It was further recommended that an operator's house be contructed at the disposal plant for the estimated cost of $350.

The entire cost of the work of extension recommended in January 1911 and outlined in the foregoing paragraphs was $13,465.

A number of minor changes were made in the proposed extensions to the sewage disposal plant and the plans and specifications were drawn up and submitted with a report to the Chief Engineer on June 22, 1911. These plans contemplated duplicating the existing sprinkling filters and installing an additional unit having an area equivalent to twice the area of the existing filters. The small units were therefore 13 feet by 40 feet in plan, similar in all respects to the existing units. The large unit was 60 feet by 25 feet in plan and in its design were incorporated a number of changes rendered necessary by the progress made in the art of sewage disposal since the former installation. To supply this unit it was also necessary to include an additional siphon chamber which was designed six feet square at the flow line with tapering sides, allowing a discharge to the nozzles under a maximum head of six feet. A sluice gate provided for draining the chamber by hand or discharging sewage continuously upon the filter. The nozzles on the larger filter were to be of the Taylor type throwing square sprays, the end nozzle on each lateral line being so arranged that it might drain the entire line between doses of sewage, thus preventing freezing during winter weather. This would allow the use of this unit as a sprinkling filter continually and do away with the necessity of changing to a contact bed during freezing weather. The capacity of the dosing tank would be approximately 575 gallons and would give a dose to the ten nozzles lasting about six minutes. The total flow would be divided at the inlet manhole so that one-half of the sewage would go to the large unit and the other half to the four smaller units. The entire effluent from the sprinkling filters would be delivered to the sand filters which were to be extended as follows:

The proposed installation was to include two units 100 feet by 40 feet each in plan duplicating the units now in operation and placed beside the same. Additional siphons would be necessitated by these two units and it was planned to arrange the battery of siphons so that they would be operated in sequence ordinarily and that any siphon might be shut off for cleaning purposes when desired, thus shutting off a corresponding unit of the sand filters. The sewage was to be distributed by wooden troughs similar to those on existing units. The total sand filter area when this work is completed would be 16,000 square feet and with a sewage flow of 150,000 gallons a day the filters would operate at the rate of 410,000 gallons to the acre and day.

It was also planned to enlarge the present chemical dosing chamber providing a detention of one hour under maximum flow. This installation was to be directly connected to the settling basin beneath the existing chemical dosing house.

The operator's house was designed 10 feet by 16 feet in plan and located 60 feet south of the settling tanks and slightly above them in elevation. The roof was to be covered with asbestos shingles and the woodwork painted to correspond in color with the institution buildings.

It was proposed to empty the sludge beds of the sand which would become badly clogged and replace it with 12 inches of screenings from the stone crusher which would facilitate the straining of the sludge thoroughly and rapidly.

It was proposed to do the entire work by contract, the Department to furnish stone for concrete, masonry and filtering material, so that the specifications as drawn up contemplated the excavation, concrete work, pipe work, placing of filter stone and construction of operator's house. The placing of sand in the filters and installation of automatic dosing apparatus was to be done under separate contract while the washing of sand and replacing of same in the sand filters was to be done by day labor.

The preliminary estimate for this contract for the extension to the sprinkling filters as outlined above was $7,851.50 while the additional work to be done on smaller contracts or by day labor was estimated to be worth $4.475 so that the entire cost for the proposed changes, exclusive of engineering would be $12,326.50. The proposed extensions were considered ample to care for any sewage discharged from the present buildings at the sanatorium.

The work on the extension to the sewage disposal plant was authorized by the Commissioner of Health and the contract advertised in the papers of the State. The Ley Construction Company of Pittsburgh were the lowest bidders as shown on the accompanying schedule of bids, and were awarded the contract. The contract was signed November 24th, 1911, and the bond executed promptly. The work was commenced on December 1st and the first monthly payment amounted to $343.20 as shown on the detailed copy herewith:

DEPARTMENT OF HEALTH

ENGINEERING DIVISION

CONTRACT NO. 15. MONTHLY ESTIMATE NO. 1

FOR WORK COMPLETED ON ADDITIONS TO SEWAGE DISPOSAL PLANT AT THE PENNSYLVANIA STATE SOUTH MOUNTAIN SANATORIUM, NEAR MONT ALTO, PENNA. FROM DECEMBER 1ST, 1911 TO JANUARY 1, 1912.

ACCOUNT OF CONTRACT WITH THE LEY CONSTRUCTION COMPANY, DATED NOVEMBER 24, 1911.

(1) Earth excavation & refill @ $0.85 per cu. yd.—500 cu. yds.,	$425 00
(2) Rock excavation & refill @ $4 per cu. yd.—1 cu. yd.,	4 00
Total,	$429 00
Deduct 20%,	85 80
Total less 20%,	$343 20

Dec. 30, 1911.

(Signed) C. A. Emerson, Jr.,
Assistant Engineer in Charge of Work

Approved (Signed) F. Herbert Snow,
Chief Engineer.

Water Works.

At the beginning of 1911, the water supply for the Sanatorium was derived from springs near the main camp and from a stream near Mount Alto Park known as the West Branch of Little Antietam Creek. The springs flow by gravity to a storage reservoir of 40,000 gallons capacity, from which it is lifted by 2 triplex pumps, each having a capacity of 100,000 gallons in 24 hours, to a large concrete reservoir of 300,000 gallons capacity through a vertical distance of 125 feet. A small spring supply in the eastern section of the camp had been abandoned as the flow during dry weather was not sufficient to warrant the maintenance of a separate pumping station.

The supply from the stream at the foot of the mountain is forced by 2 triplex pumps, each having a capacity of 150,000 gallons in 24 hours, to the top of the mountain near the Infirmary where it is proposed at a future time to erect a storage tank and mechanical filters, and from this point is connected to the camp distributing system by a 6 inch cast iron pipe. The storage tank contemplated is located at an elevation which would afford a nozzle pressure of about 60 pounds per square inch in the main camp. The contract for the Little Antietam Creek work was completed in the Fall of 1910.

The flow of the springs began to decrease about this time and in October the supply from these sources amounted to only 42,000 gallons in 24 hours and it was found necessary to place the new station in operation. As this supply was liable to pollution at places on the watershed the water was treated with copper sulphate and also commercial bleach.

The average water consumption at this time of the year was about 80,000 gallons each 24 hours, so that it was decided to use the entire spring supply and to augment it from the Park system. At the beginning of 1911, the spring supply was about enough to supply the institution and the lower plant was operated at intervals only in order to keep it in condition at all times in case of sudden necessity.

The distributing system as outlined in previous reports is so arranged that the reservoirs may be shut off in case of fire and the water pumped directly under pressure into the mains. The total contract cost of the entire system is as follows:

Spring collecting systems, reservoirs, camp pumping station and distributing pipes,	$25,324 10
Park pumping station and force line to Infirmary,	15,858 77
Total,	$41,182 87

It was pointed out, in the report to the Chief Engineer in January 1911, that as the Institution grows the auxiliary supply will be called into use more and more during certain seasons of the year and that since this supply is liable to pollution from picnic parties drinking at the springs and from the stream, it would be well to install mechanical filters and a steel storage tank which would give complete assurance as to quality of the water and at the same time increase the storage to a quantity adequate for fire protection. It was proposed that the steel tank be 50 feet in diameter and 20 feet deep for a storage capacity of 290,000 gallons, resting on a concrete foundation. A small observation tower 10 feet above the top of the tank is also contemplated. The additional supply furnished from this source would be equivalent to about 3 days average supply for the domestic use of the Institution and would furnish a fire protection for several hours at the main camp.

The estimated cost of this construction was $10,900.00. The portion of this amount estimated as the cost of the steel tank is based upon figures received in 1910 for a similar tank.

The filters were to be placed behind the Infirmary at an elevation of about 1735. There were to be 2 units of reinforced concrete with a capacity of 150,000 gallons for 24 hours each when operated at a rate of one hundred and twenty-five million gallons to the acre for 24 hours. These filters were to be filled with 10 inches of selected gravel and 30 inches of selected quartz sand and equipped with rate controllers, loss of head gauges and a complete system of operating valves. They were to be covered by a frame building resting on a concrete foundation and having an asbestos shingle roof. They were to be connected to the steel tank by about 600 feet of cast iron pipe and also to the distributing system near the Infirmary. Valves to be so placed that the filters may be by-passed in case of fire.

It is estimated that the filters as described will cost $5,000.00. It was further proposed that the engineer at the Park pumping station should be connected by telephone to the institution so that he could be immediately notified to start the pumps. A site about 200 feet from the pumping station was suggested as a suitable place for the operator's house, which it was proposed to provide by moving a small unused cottage from the lower camp. The estimated cost of this work was $200.00.

A summary of the foregoing proposed extensions is as follows:

Steel tank complete with valves, pipe lines and foundations,..	$10,900 00
Concrete filters, filter house and pipe line, ...	5,000 00
Installing operator's house at lower pumping station, ...	200 00
	$16,100 00

These improvements were reported to be highly desirable and entirely justifiable and if carried out would provide the institution with a bounteous supply of potable drinking water and greatly increased fire protection.

A report dated July 1st, 1911, aside from outlining the conditions stated in the foregoing paragraph, gave the following information:

There are 11 fire hydrants installed at the institution and an additional one has been authorized which will shortly be installed. These hydrants are two-way anti-freezing type standard hydrants with two 2½ inch nozzle connections and are distributed as follows:

One on 3 inch line near barn.
One on 6 inch line at 5th Street and Avenue F.
One on 3 inch line at 4th Street and Avenue C.
One on 6 inch line at 4th Street and Avenue F.
One on 6 inch line at 4th Street and Avenue J.
One on 6 inch line at 2nd Street and Avenue B.
One on 6 inch line at 2nd Street near old Assembly Hall.
One on 3 inch line near south end of Laundry.
One on 6 inch line in front of Staff Building at Infirmary.
One on 6 inch line at north end of Infirmary.
One (authorized) on 4 inch line in rear of Infirmary.

There are at present 1,400 feet of 2½ inch rubber lined standard linen fire hose at the institution distributed as follows:

300 feet on hose-cart in barn.
400 feet in pavilion at 4th Street and Avenue F.
300 feet on hose-cart in old Assembly Hall.
400 feet on stationery reel in basement of Infirmary.

A nozzle with ¾ inch opening is attached to each hose and a hydrant wrench is also provided for each line. The couplings and wrenches are interchangeable.

Tests made in June 1911, showed that the water pressure at various fire hydrants was not sufficient to properly protect the institution and it was therefore recommended that the steel tank as already described be installed as soon as funds were available for this purpose.

All of the other buildings are fitted with interior standpipes with outlets at each floor and standard 2½-inch unlined linen fire hose is provided at each outlet and each hose has attached to it a standard nozzle with a ¾-inch opening. The fire protection system is outlined in the following tables:

Building.	No. of openings.	Total length of hose.	Hand fire extinguishers.
Dining Building:			
Basement,	4	250 ft.	2
First floor,	5	300 ft.	3
Second floor,	4	250 ft.	6
Attic,	4	250 ft.	6
Dispensary:			
Basement,	1	50 ft.	1
First floor,	1	50 ft.	....
Second floor,	1	50 ft.	1
Attic,	1	50 ft.	1
Children's Building:			
Basement,	2	200 ft.	....
First floor,	2	200 ft.	....
Second floor,	2	200 ft.	....
Attic,	2	200 ft.	....
Nurses' and Physicians' Building at Camp:			
Basement,	1	100 ft.	....
First floor,	1	100 ft.	....
Second floor,	1	100 ft.	....
Attic,	1	100 ft.	....
Barn,	2	100 ft.	....
Infirmary:			
Basement,	6	450 ft.	4
First floor,	7	500 ft.	9
Second floor,	6	450 ft.	5
Attic,	4	350 ft.	6
Nurses' and Physicians' Building, Infirmary:			
Basement,	1	75 ft.	....
First floor,	1	75 ft.	....
Second floor,	1	75 ft.	....
Third floor,	1	75 ft.	....
Laundry:			
First floor,	1	50 ft.	1
Second floor,	1	50 ft.	1

The smaller buildings are also provided with hand fire extinguishers as follows:

Bath houses,	4
Old Assembly Hall,	2
Twin cottage,	6
Nurses' Home,	2
Administration Building,	5
Chicken House,	2
Women's Camp,	5
Men's Camp,	6
Pavilions,	1
Lower Camp,	2

After completion of the new buildings the institution will be provided with 4,700 feet of interior fire hose. There are 84 hand fire extinguishers already and the new buildings will be equipped with additional extinguishers which are all discharged and refilled once each year. There are also three 20 gallon chemical engines distributed as follows:

One in basement of Dining Building.
One on first floor of Dispensary.
One on second floor of Infirmary.

The report goes on to explain in detail the necessity for installing the steel tank as an additional precaution against fire and recommends as well the installation of other additional fire hydrants in the main camp located as follows:

Northeast corner of 5th street and Avenue D.
Northeast corner of 5th street and Avenue H.
Southeast corner of 4th street and Avenue H.
Northwest corner of 3rd street and Avenue D.
Northeast corner of 3rd street and Avenue F.
Southwest corner of 2nd street and Avenue F.
Southeast corner of 2nd street and Avenue H.

The reason for this recommendation is dealt with in detail and it is stated that it will be necessary to add these hydrants and install 295 feet of 4 inch cast iron pipe and 200 feet of 6 inch cast iron pipe.

It was further recommended that a small hose house be placed between the pavilions facing on avenues D and E between 3rd and 4th streets, to be constructed of wood with swinging doors which could at all times be opened without the key. In this house could be stored the hose now kept at the barn. It was further suggested that a suitable hose cart be purchased for the hose now stored at this point. This report also recommended a similar small house to be built behind the Infirmary to store the hose now kept in the basement of that building.

The estimated cost of carrying out the foregoing recommendations was given as $1,081.25.

The following table gives the weekly totals of the operation of both upper and lower pumping stations. The total quantity of water pumped during the year was about 39 million gallons with an efficiency, in gallons of water to the gallon of gasoline, of 3,485 from the lower station and 7,630 from the upper, a difference due to the greater head under which the pumps in the lower station work.

Week begins.	Lower Plant—Total gallons pumped.	Upper Plant—Total gallons pumped.	Total gallons pumped during the week.	Daily average gallons pumped for seven or six days.	Total gallons gasoline used.
Jan. 1,	416,000	431,560	847,560	121,080	58.0
Jan. 8,	689,000	373,050	1,062,050	177,010	244.7
Jan. 15,	....	321,130	321,130	53,520	43.1
Jan. 22,	....	500,980	500,980	83,490	67.4
Jan. 29,	104,000	551,080	655,080	109,170	105.4
Feb. 5,	305,950	446,760	752,710	125,450	150.9
Feb. 12,	338,500	531,390	869,890	144,980	203.6
Feb. 19,	114,830	155,160	269,990	45,000	70.5
Feb. 26,	114,830	556,190	671,030	111,840	116.4
Mar. 5,	139,750	415,030	554,780	92,460	112.1
Mar. 12,	364,000	328,000	692,000	115,330	184.4
Mar. 19,	648,000	488,810	1,136,810	189,470	146.6
Mar. 26,	162,500	576,830	739,330	123,220	116.5
April 2,	91,000	571,440	662,440	110,410	100.3
April 9,	136,500	574,196	710,700	118,450	111.3
April 16,	124,330	642,680	767,010	127,830	117.3
April 23,	235,460	420,060	655,520	109,250	122.1
April 30,	409,500	306,050	715,550	119,260	148.6
May 7,	234,000	381,700	615,700	102,620	112.2
May 14,	117,000	602,000	719,000	102,710	108.5
May 21,	188,500	564,050	752,550	107,507	124.5
May 28,	256,750	556,850	813,600	116,230	138.8
June 4,	143,000	539,650	682,650	111,807	105.9
June 11,	201,500	601,150	805,650	114,800	130.3
June 18,	224,250	588,600	812,850	115,600	133.3
June 25,	175,500	535,350	710,850	101,800	115.1
July 2,	240,500	466,550	707,050	101,000	123.6
July 9,	52,000	582,654	634,655	90,665	88.7
July 16,	100,750	786,750	887,500	126,785	103.1
July 23,	104,000	580,500	684,500	97,785	95.0
July 30,	221,000	537,500	758,500	76,785	69.6
Aug. 6,	188,500	473,000	581,500	83,070	110.1
Aug. 13,	325,000	442,900	767,900	109,700	144.4
Aug. 20,	71,500	408,500	480,000	68,570	75.7
Aug. 27,	333,500	469,250	802,750	114,680	150.7
Sept. 3,	....	611,400	611,400	87,345	78.4
Sept. 10,	110,500	602,000	712,500	101,785	107.1
Sept. 17,	240,500	592,550	833,050	119,005	137.1
Sept. 24,	191,750	472,900	664,650	94,950	112.4
Oct. 1,	364,000	571,900	935,900	133,700	171.5
Oct. 8,	204,750	571,900	776,650	110,950	128.3
Oct. 15,	416,000	567,600	983,600	140,510	176.1
Oct. 22,	286,000	584,800	870,800	124,400	152.1
Oct. 29,	448,500	440,750	889,250	127,000	231.1
Nov. 5,	949,000	240,800	1,189,800	169,970	....
Nov. 12,	578,500	378,400	956,900	136,500	271.2
Nov. 19,	195,000	500,950	695,950	99,400	175.5
Nov. 26,	396,500	667,575	1,064,075	151,900	281.8
Dec. 3,	221,000	604,150	825,150	117,880	246.5
Dec. 10,	110,500	660,050	770,550	110,080	173.9
Dec. 17,	282,750	617,050	899,800	128,545	228.0
Dec. 24,	78,000	629,950	707,950	101,135	151.6

Garbage Disposal.

The two units of the garbage incinerator have been in constant service with the exception of short periods for repairs. During the year the average service given by both units was eight pounds of refuse destroyed to one pound of coal, while the average daily amount of refuse destroyed was 2,539 pounds, all of which is given in the following tables:

Week begins.	Pounds garbage.	Pounds sputum boxes.	Total pounds refuse.	Pounds coal used.	Pounds refuse to pound coal.	Pounds refuse daily average.
Jan. 1,	12,242	1,625	13,867	1,870	7.4	2,310
Jan. 8,	12,517	1,625	14,142	1,645	8.6	13,757
Jan. 15,	13,146	1,750	14,896	1,630	9.1	2,470
Jan. 22,	12,007	1,750	13,757	1,605	8.6	2,290
Jan. 29,	11,964	1,600	13,564	1,695	7.7	2,250
Feb. 5,	11,885	1,600	13,485	1,560	8.6	2,240
Feb. 12,	12,470	1,525	13,995	1,930	7.3	2,330
Feb. 19,	12,274	1,575	13,849	1,660	8.4	2,315
Feb. 26,	11.961	1,575	13,536	1,810	7.5	2,255
Mar. 5,	12,333	1,672	14,005	1,725	8.1	2,335
Mar. 12,	12,553	1,644	14,197	1,620	8.7	2,370
Mar. 19,	12,557	1,719	14,276	1,635	8.7	2,375
Mar. 26,	12,191	1,558	13,749	1,840	7.5	2,285
April 2,	14,191	1,460	15,651	1,890	8.3	2,610
April 9,	14,222	1.490	15,712	1,785	8.8	2,620
April 16,	14,291	1,579	15,870	1,935	8.2	2,650
April 23,	12,168	1,715	13,883	1,650	8.4	2,315
April 30,	13,284	1,640	14,924	1,785	8.4	2,490
May 7,	15,177	1,660	16,837	2,070	8.1	2,805
May 14,	14,646	1.822	16,468	2,035	8.1	2,745
May 21,	14,047	1,970	16,017	2,005	8.0	2,670
May 28,	14,535	1,832	16,367	1,930	8.5	2,720
June 4,	13,840	2.093	15,933	2,005	7.9	2,655
June 11,	14,765	2,166	16,931	1,960	8.6	2,420
June 18,	14,140	2,009	16,149	2,070	7.8	2,300
June 25,	13,936	2.042	15,978	1,860	8.6	2,275
July 2,	14,225	2,235	16,460	2,020	8.2	2,350
July 9,	13,790	2,310	16,100	1,935	8.3	2,300
July 16,	14,305	2,425	16,730	2,150	7.8	2,380
July 23,	14,855	2,253	17,108	2,215	7.8	2,440
July 30,	15,320	2,195	17,515	2,419	7.2	2,500
Aug. 6,	19,212	2,813	22,025	3,593	6.1	3,140
Aug. 13,	14,648	2,555	17,203	2,225	7.7	2,460
Aug. 20,	14,298	2,407	16,705	2,095	8.0	2,380
Aug. 27,	16,314	2,557	18,871	2,380	7.9	2,690
Sept. 3,	17,891	2,729	20,620	2,545	8.1	2,930
Sept. 10,	16,771	2,432	19,203	2,615	7.4	2,740
Sept. 17,	15,659	2,694	18,353	2,750	6.7	2,620
Sept. 24,	16,216	2,770	18,986	2,430	7.8	2,710
Oct. 1,	15,011	2,765	17,716	2,305	7.7	2,505
Oct. 8,	16,377	2,836	19,213	2,090	9.2	2,740
Oct. 15,	16,197	2,469	18,666	2,350	7.9	2,660
Oct. 22,	16,146	2,802	18,948	2,350	8.1	2,710
Oct. 29,	14,017	2,572	16,589	2,190	7.6	2,640
Nov. 5,	14,470	2,446	16,916	2,170	7.8	2,580
Nov. 12,	16.150	1,651	17,800	2,310	7.7	2,540
Nov. 19,	18,718	1,991	20,710	2,537	8.1	2,950
Nov. 26,	15,333	2,632	17,965	2,231	8.0	2,570
Dec. 3,	16,295	2,795	19,090	2,414	7.9	2,740
Dec. 10,	16,670	2,765	19,435	2,625	7.4	2,770
Dec. 17,	16,575	2,734	19,310	2,857	6.8	2,760
Dec. 24,	16,610	3,302	19,910	2,685	7.5	2,830

Miscellaneous.

It was found that waste matter was being discharged from the acetylene gas generators into the sewers adding to the flow through the disposal plant and also destroyed the biological action in the different settling tanks. An investigation was made to determine the best manner in which to obviate this additional tax on the sewerage system. A report dated July 25, 1911, sets forth the following facts. One of the three acetylene generators which supplied the sanatorium is located in the eastern part of the camp near the stable; another is just west of the main dining building and the third is in the rear of the hospital. The waste from the first generator discharges onto the ground in the woods back of the barns while the other two are joined to the sanitary sewerage system. A settling basin is provided between each generator and the main sewer which is supposed to intercept all solid matters. The generator at the dining building is the largest, having a capacity of about 600 gallons of liquid. The settling basin is an underground concrete tank 8 feet square and 6 feet deep with the bottom approximately 15 feet below the ground surface. The basin is covered, and a manhole cover gives access to the same from the surface. The drain pipe from the generator is of terra cotta discharging into the basin one foot above the surface of the water. The outlet is placed directly opposite the inlet and extends down hill to the sewer line at the public road in front of the institution. The generators are emptied and recharged about twice a week during winter months and once a week during the summer months at which time the solid matter flows with a rush into the settling basin and a large proportion of the solid matter is carried across and directly out through the outlet pipe. This liquid is milky white and its presence is noticeable even at the disposal plant. It is reported that about 2,000 pounds of carbide is used each week and it is estimated that one-half of this amount is carried over into the sewer. It is supposed that when the sediment in these basins is near the top that a larger proportion of the solid matter is carried over into the sewers. This sediment is removed through the manhole at intervals.

The generator at the hospital is similar to the one near the dining building though smaller and its action is the same. The drain from this generator enters the sewer in front of the infirmary.

It is estimated that the calcium wastes from these generators represents from one-fourth to one-third of the total amount of sludge at the disposal plant and this is indicated by the appearance of the sludge. It was reported that the presence of this waste has been more marked during the preceding winter and spring. It is probable that this calcium oxide has an inhibitive action on the anaerobic and facultative bacteria in the primary treatment tanks and it is certain that the increased amount of sludge adds to the operating expense and for this reason, if for no other, this waste should be excluded from the sewers.

The settling basins at the acetylene plants are not supplied with baffles so that it is probable that such baffles if properly designed would intercept a larger amount of the solid matter. However, a large amount of it is in such a finely divided state that even then large quantities would be carried past the settling basin. It is therefore, suggested that these waste outlets be disconnected from the sewer system and run across the main highway and discharged onto the ground at a point hidden from view from the institution. The discharge from the plant at the hospital could be disconnected and carried into the woods south of the road from the hospital to the ice pond and there discharged onto the surface of the ground. It would be advisable, however, to install an additional settling basin with baffles on these extended drains to prevent the greater part of the solid matter from being discharged onto the ground. Additional baffles were also recommended for the generator settling basins to prevent direct current from inlet to the outlet end of the same. The total cost of these changes was estimated to be $300.

The new settling basins as recommended were to be 5 feet by 3 feet in plan with a total depth of 4 feet 3 inches and an effective depth of 2 feet 9 inches or a capacity of 300 gallons. The top of the walls were to project 3 inches above the ground and the tanks were to be uncovered. Wooden baffles extending from the top of the walls were to continue to about 15 inches above the floor line with the inlet and outlet ends and a baffle in the center was to extend from the bottom to within 3 inches of the surface. It was deemed advisable also to increase the pipes to 6 inches in size. The construction of these settling basins and changes in the outlet lines was authorized by the Commissioner of Health and the work was performed by day labor.

It was found necessary to care for the storm water in the upper camp by the construction of storm gutters to prevent the washing away of some of the improved streets at the institution. It was found that during heavy rains the run-off deeply eroded the surface at a number of points. The general scheme to obviate this condition contemplated the construction of paved gutters on each side of the streets running north and south in the camp. with cross gutters at Third, Fourth and Fifth streets. These were to carry the storm water to a main gutter on the south side of Second street and the run-off was estimated to necessitate deepening this main gutter and at intervals to construct relief drains leading to the main road in front of the institution, to relieve it of a part of the flow.

The gutter as proposed was 4 feet wide, one foot deep, paved with native stone placed on edge, bedded in cinders and thoroughly rammed. It was proposed to construct 6,075 feet of these gutters, which at the cost of ninety cents a square yard, including excavation and ramming would make a total estimated cost of $1,822.50.

The proposed relief drains to tap the Second Street gutters were to be 12 inches in size and were to lead out of the inlet basin at the various street intersections. These basins were to be covered with a cast iron grating similar to those on the main road to the institution then being constructed. These basins were to be of rubble masonry and it was estimated that the total installation of pipe lines, basins and grating would cost $418.50.

In addition to the above construction it was recommended that the gutter along the public road in front of the institution be cleaned out and enlarged and it was estimated that this work would not exceed $50 in cost. The total cost of the proposed alterations which would do away with considerable repair work after storms is summarized as follows:

Paved gutters,	$1,822 50
Inlet basins and relief drains,	418 50
Gutter along public road,	50 00
Total,	$2,291 00

This work was authorized by the Commissioner of Health and carried on by the employees of the institution.

B—PENNSYLVANIA STATE SANATORIUM FOR TUBERCULOSIS CRESSON, CAMBRIA COUNTY.

Sewerage.

On August 4, a report was made of an investigation to ascertain the possible points of disposal of the sewage from the Pennsylvania State Sanatorium for Tuberculosis near Cresson, Cambria County. The buildings are located about 1½ miles east of the Pennsylvania Railroad station at Cresson on a tract of about 500 acres, nearly all of which is covered by second growth timber at an elevation of about 2,500. The property is on the divide between the Susquehanna and Allegheny River watersheds and the natural drainage from the various parts of the property is north, east and west. The ridge forming this divide extends through the eastern portion of the property in a north and south direction with the greatest elevation in the southeastern part of the property, the slope dropping from this point to the northern and western boundary. The buildings are along this ridge near the summit and in the southeastern portion of the property and face east and west. The power plant and laundry building are located north of the main buildings and about half way between them and the public highway.

The northern portion of the tract is north of the public road and consists for the greater part of cleared land near the village of Summit This area drains into Bradleys Run which flows northerly into Clearfield Creek and thence to the Susquehanna River. The eastern portion east of the divide drains into Blairs Gap Run and Adams Run and thence into the Juniata River. The main portion of the tract consists of property south of the public road which drains west into several of the small streams and thence into the Conemaugh River. This branch of the Conemaugh River drains southwesterly and joins the branch which drains the territory surrounding the borough of Cresson. South of the property the land continues along the crest of the watershed draining easterly and westerly into a number of small runs which flow on the east into the Juniata and west into the Conemaugh River.

It had been determined that the sewage from the institution might be disposed of in two ways. First, by constructing an outfall sewer to connect with the sewers of Cresson borough, and second, by the construction of a sewage disposal plant for the institution. The first method would be cheaper but would involve at some time a joint sewage disposal plant with the borough of Cresson. For various reasons the former project was abandoned by the Department upon recommendation of the Engineering Division and it was decided to construct a sewage disposal plant which would care for the institution sewage.

The site at first selected for this disposal plant was near the western border of the property in a wooded area about 200 feet in elevation, below the main buildings. The outfall from this plant would drain eventually into the Conemaugh River through the small streams already mentioned. The objectionable features of locating a plant in this place are that the waters of the stream into which the effluent would be discharged are almost dried up at certain periods in the summer and that several families nearby use the stream as a source of domestic supply and an ice dam has also been constructed less than a mile below the proposed outfall.

The effluent from the disposal plant should not be discharged on the eastern slope of the property which drains into Blairs Gap Run and Adams Run which feed large storage reservoirs forming the source of supply for the Blair Gap water supply and the Hollidaysburg Water Works Company. It would not be advisable to discharge the sewage through a pipe line in a southerly direction as this would necessitate building a pipe line about ¾ of a mile long through private property before an outlet would be available into Burgoon Run. This stream is dry during the summer for some distance below its source and in order to reach the point where the effluent would at all times be diluted by natural waters this pipe line would have to be extended another half mile, involving expense of construction on account of the character of the ground and the formation of the country.

The possibility of carrying the sewage northerly across the public road and there disposing of it by broad irrigation on the State property would not be advisable as the soil appears to be rather impervious and would require a considerable area. Moreover, to add sand enough to make the soil more permeable or to construct a sand filter system so as to reduce the area required, would be very expensive owing to the high cost of the sand in the locality. Several springs outcrop along this property in the direction of Cresson. A broad irrigation system would also endanger these springs which are used as a source of independent water supply for many of the residents of Cresson borough and vicinity. The possibility of disposing of sewage by drilling into the ground and striking open veins in the coal measures was considered and abandoned because such drilling would be expensive and the results would be uncertain as it might contaminate numerous shallow wells in the locality and also the deep well which the Department was drilling. As noted, the extreme northern portion of the property drains into Bradleys Run and it would be possible to construct a sewage disposal plant at the head of a small gulley in this locality in a wooded area between the Old Portage Road and the public highway. Such a plant would be about 100 feet in elevation below the power and laundry building and about 3,500 feet distant from it which would allow sewers to be constructed at an approximate average grade of three per cent. The effluent would be discharged into this gulley and flow through a stone culvert beneath the Old Portage Road on the extreme northern boundary of the State property and thence continue down the course of Bradleys Run. An inspection of this course was made on July 31, 1911, and it was found that the bed of the stream was composed mostly of rock and small disintegrated stone. No water was flowing for a distance of about three-quarters of a mile below the proposed location of the plant. At several points small springs were found which disappeared into the soil nearby. About 1¼ miles below the State property the stream passes beneath the Pennsylvania Railroad right of way near which point several springs augment the flow of the stream, making at the time of this inspection a total flow of about 30,000 gallons a day. Just below the railroad a million gallon reservoir is located to supply water for some coke ovens but this water is not used for drinking purposes. This stream is polluted below Gallitzin by mine drainage and sawmill waste as is also Clearfield Creek. The records of this Department and of the Water Supply Commission do not show the use of this stream as a source of public water supply. Bradleys Run passes from the institution property through lands of the Pennsylvania Coal and Coke Company, Taylor & McCoy Coke Company, Joseph Boland, and the Pennsylvania Railroad Company. For a mile below the Old Portage Road there are no houses near the stream but just below the railroad a group of houses is within sight of it but several hundred feet distant and 50 feet in elevation above the same. These houses are a mile below the proposed outfall and it is not believed that the discharge of sewage from the plant will be objectionable at this point. It is believed that a great deal of sewage will find its way into the ground during the dry weather and since the coal measures are from 50 to 100 feet below the creek no trouble is anticipated from sewage percolating into the mines.

It was stated that, if the plant were located on Bradleys Run the sewer line from the main buildings to the power and laundry building would be the same as in the location of the plant at the foot of the slope on the western boundary of the property. The main sewer would be approximately 500 feet longer than in the former case and cost about $500 more. In the former location water lines 300 feet in length would give an abundant supply from the proposed force main to flush the units of the plant. In order to secure a water supply at the site on Bradleys Run it would be necessary to lay a pipe line from the power and laundry building to the disposal plant or to install an elevated tank near the plant and by that means use purified sewage for flushing purposes. Such a pipe line would cost $700 or an elevated tank and pump, the latter of which is already on the ground, would cost $150.

It was shown in this report that one man would probably be able to care for the sewage disposal plant and water pumping station in the first suggested location as the two plants would be within 100 feet of each other. The Bradleys Run site would necessitate a man for that part of the work and increase the maintenance cost by the amount of the extra wages. On the other hand, this site offers certain disadvantages. The dry creek bed would probably absorb a large amount of the effluent and more important still no drinking water supplies would be endangered and it was therefore recommended that this location be decided upon. After carefully considering the various locations, the Commissioner of Health decided that the site north of the turnpike draining into Bradleys Run was the most desirable and instructed that plans and specifications for a disposal plant in this location be prepared. The plans as prepared, contemplated and construction of Imhoff tanks, dosing tanks, screen chamber, sprinkling filter, disinfection house, resettling basins and sludge bed, and a sanitary sewer system for all the institution buildings.

The buildings under construction accommodate 320 patients, and another ward building contemplates accommodations for 160 patients, and it is therefore assumed that the total population of the institution, including employes, would in the course of a few years be about 600, divided between two ward buildings and 20 cottages with servants and staff. The average flow of sewage is estimated at 75 gallons per capita a day, the greater part of which would occur during 12 hours, which would make the daily flow about twice the annual average daily flow. On this basis it seems advisable to design the plant to handle 100,000 gallons of sewage each 24 hours. From the disposal plant the sewer extends across the fields and turnpike in a southerly direction to the power and laundry building, where it extends to a point near the northern end of the East Ward building where it receives sewage from a part of that building and also from the Administration building and dining building kitchen. From there the sewer extends 360 feet to a point near the dining building where it receives sewage from the main dining building. The total length of the main sewer is about 5,500 feet. Concrete manholes are placed at a miximum distance of 350 feet. The grades vary from 0.5 per cent. to 5.9 per cent. On the minimum grade the sewer would have a capacity of about one-half million gallons for 24 hours. Sewage flowing to the disposal plant enters the screen chamber 4 feet by 3 feet 6 inches in size, having a depth of 4 feet. Screen rods with a clear opening of three-fourths of an inch and a sheet iron receptacle for dividing the screenings separate the large matter from the sewage which passes through terra cotta pipes to the Imhoff tanks. These lines are controlled by gate valves which allow the closing off of either tank for cleaning and repairs.

The Imhoff tank was selected on account of the good results it had recently shown, both abroad and at the Spring Garden Testing Station in Philadelphia, as well as at the testing station of the Sanitary District of Chicago. This type of sewage tank was also under construction at the Pennypack Creek disposal plant in Philadelphia, the sewage disposal plant for Atlanta, Georgia, and several smaller places in this country. The tank is covered by patents but it is understood that a small fee will secure the rights for this institution. The great advantage obtained by the use of this type of tank is that the sludge is thoroughly digested and free from offensive odors as verified at plants in Germany and sustained by experiments in this country. This is a very important point as odors have rendered a large number of plants in this country objectionable.

The tanks as designed are of reinforced concrete, are circular with an interior diameter of 12 feet. The vertical walls extend 16 feet deep and below is an inverted conical-shaped bottom. Sewage flowing into the tank is kept separate from the settling sludge by means of division or compartment walls which allow the settled solid matter to pass through an opening in the bottom into the conical shaped lower compartment where it is digested for a long period. In the tank proposed the division walls and baffles are constructed of cypress, steel and angles.

A transverse baffle is provided between the division walls extending from the top of the tanks downward for 7 feet. This baffle thoroughly mixes the sewage and will tend to secure a uniform velocity throughout the tanks. Scum rising to the surface cannot pass inside the division walls but must rise on the outside where it may be easily removed. The digested sludge in the lower compartment will be drawn off at intervals through a 6 inch pipe line leading to the sludge bed.

A connection operated by a sluice valve is made to each tank 14 feet 6 inches below the top of the walls and leads to the settling basins for the purpose of drawing down the sewage level at times of cleaning. A detention of 5½ hours in each tank is estimated based on the average daily flow of sewage. Since, however, the daily flow is about double the average flow, the detention will be only 2¾ hours during the day. The chamber in the tanks has a capacity of about 25 cubic yards which will allow a sludge storage of about 5½ months assuming the sewage to flow at the rate of 50,000 gallons a day and to contain 3 cubic yards to a million gallons of sewage.

The top of the tank walls will be 5 feet above the original surface and will be surrounded by embankments, thus saving considerable excavation.

From the Imhoff tank sewage passes to the syphon chamber which is of reinforced concrete with a roof of the same material. This chamber is divided into 2 compartments, one a hopper-shaped section 9 feet square on top and 3 feet square on the bottom, and the other a discharge compartment one foot 6 inches wide by 9 feet long. A syphon will be set in the former compartment and will have a depth of 5 feet with capacity of 365 gallons a minute. The maximum head over the sprinkling filter nozzles will be 8 feet. An 8 inch cast iron pipe controlled by a valve is provided in case the syphon is out of commission or if it is desired to apply the sewage continuously to the filters.

The sprinkling filters to which the sewage passes from the syphon chamber has a filtering surface of 42 feet by 56 feet and a depth of stone varying from 7½ feet to 8½ feet and is divided into two unequal parts, the smaller being one-fourth of the total area and arranged for use as a contact bed during winter nights when there would be danger of the sprinkling nozzles freezing. During the day time in winter and at all times during the summer the smaller compartment will be operated as a sprinkling filter the same as the large compartment. Sewage is distributed over the surface of the stone by 12 sprinkling nozzles of the square spray Taylor type, spaced 14 feet apart. These nozzles are arranged in sets of three and supplied through a 4 inch cast iron distributor branching from the terra cotta pipe extending along the upper end of the filter. A valve controls each lateral distributor so that any set of nozzles may be closed off, if desired. At the upper end of the filters a ventilation or flushing gallery 3½ feet wide provides access to the controlling valve and to the underdrains beneath the filter stone. Portions of the walls of the filter are composed of dry rubble masonry, allowing the passage of air through the crevices, thus aerating the filter stone. The remainder of the walls are reinforced concrete. The filtering material will be local sandstone crushed and screened to a size passing a 2½ inch ring and retained on a one inch ring. The underdrains on the smaller compartment will be of split vitrified tile and the large compartment will be underdrained by flat vitrified tile slabs laid over grooves in the floor, having one-half inch by 6 inch slots spaced 3½ inches on centres. The lines and underdrains are placed about 6 inches on centres over the entire floor affording means for the rapid removal of filtered sewage. From these underdrains the liquid passes to the main collecting drain along the lower wall. The underdrains extend as before mentioned, into the flushing gallery as well as into this drain and can be flushed through the operating gallery by means of a 2 inch water line which is installed at that point.

The filters will operate at a rate of 2,000,000 gallons an acre each 24 hours when the sewage is received at the rate of 100,000 gallons in 24 hours which will be probably during 12 hours each day. The syphon chamber when operating 12 nozzles will be filled in 44 minutes and emptied in 11 minutes when sewage is received at the average rate of 50,000 gallons in 24 hours, but when the rate increases to 100,000 gallons the chamber will be filled in 22 minutes and discharged in 13 minutes. Therefore, the nozzles will be in operation about one-third of the time and the application of sewage to the filter surface will be about 120 gallons to the square foot each 24 hours.

From the sprinkling filters the sewage passes to the disinfection house built of sandstone with asbestos shingle roof and a concrete foundation 16 feet square. Two concrete mixing tanks, each 6 feet by 3 feet by 3 feet deep, are provided for mixing the chemical solution, which passes from the small orifice box and thence into the mixing chamber beneath the floor. The chemical is added to the sewage in a chamber 15 feet by 6 feet while the other chamber contains the sludge pump, which will lift the liquid from the sludge beds to the chemical dosing chamber just mentioned. A concrete manhole 3 feet square, beside the disinfection house, receives the sewage from the pit beneath the house and from this manhole it is discharged into the resettling basins through pipe lines controlled by shear valves so that either or both of these basins may be operated.

These resettling basins are 10 feet by 16 feet in plan with vertical walls 2½ feet high and bottom sloped to a central gutter. A cypress baffle is placed 4½ feet from the inlet end, to secure uniform distribution of sewage through the cross section of the basins. A metal measuring weir 3 feet in length is set on the outlet end of the basins. After flowing over these weirs, the sewage passes to the collecting manhole nearby. A small baffle, placed before these weirs, prevents scum being carried over into the outlet pipe. The liquid can be drawn down 2½ feet below the tops of the walls, through 6 inch pipe lines controlled by gate valves, to allow cleaning of the basins. These pipe lines also discharge into the outlet manhole. Six inch cast iron sludge lines controlled by valves drain the gutters in the bottom of the basins to the manhole and from this the sludge is led back to the sump beneath the disinfection house. A 6 inch terra cotta line discharges from this manhole into the sludge field, so that the accumulation in the bottom of the settling basins and chamber under the disinfection house may be discharged by gravity to the sludge field. The basins have a capacity of about 6,150 gallons, giving 3 hours detention on an average flow or 1½ hours on the maximum daily flow which added to the storage under the disinfection house allows a period of contact after chemical disinfection of about 2 hours during maximum flow.

The sludge bed is located near the resettling basins and is 40 feet by 20 feet in plan with sloping sides and bottom lined with 6 inches of concrete in order to prevent leakage. Sludge is distributed over the surface by means of wooden troughs. The filtering material is crushed stone 12 inches deep in three layers. The bottom layer, six inches deep, consists of stone passing a 2 inch ring and retained on a one inch ring; the second layer, 4 inches deep, passing a three-fourth inch ring and retained on a one-fourth inch mesh and the third or top layer 2 inches deep passing a one-fourth inch mesh and retained on a one-sixteenth inch mesh. This thin layer is used to take the place of the sand layer generally required in order to secure rapid drying and draining of the sludge The bed is underdrained by 6 inch tiles 10 feet on center in the bottom of the basin, which lead to a 10 inch drain along the western side of the bed. Sewage enters this and is carried to a collecting manhole and thence by gravity through a 6 inch drain to a sump under the disinfection house, from which it is lifted by a hand force pump to the chemical dosing chamber.

Sewage passes from the outlet manhole of the resettling basins through an 8 inch pipe into the dry course of the head water of Bradley's Run near the Old Portage Road, northwest of the property of the State and continues as described in the foregoing part of this section of the report.

The estimated cost of constructing the sewers and sewage disposal plant exclusive of engineering supervision and any payment for patent rights is $17,715.25. As stated above, the plant is designed to care for the sewage from an institution with a population of about 600. In all probability the population of this institution will not exceed 450 for several years but this smaller population would not materially change the cost of the plant. The only saving which could be made would be in size of the sprinkling filters which would amount to about $1,000 but when the institution grows sufficiently to necessitate an increase in filters the cost for such an increase would more than offset the difference in the original cost for the larger filters and it was recommended that the plant be constructed as outlined above to care for sewage at a maximum rate of 120,000 gallons each 24 hours and further that the sewerage and sewage disposal plant be constructed by contract.

Drilled Well.

As stated in the 1910 annual report, a contract was awarded to Samuel A. Louder for drilling a 12 inch diameter well on the State's property as a source of water supply for the institution. After carrying the well to a depth of 94 feet the contractor failed and the work was carried on by this Department by day labor. On the first of January the well was at a depth of approximately 345 feet.

Drilling was carried on during the year, but a great number of delays were experienced due to breakdowns in the drilling machine. The apparatus which the contractor had furnished for this work and which was taken over by the Department was not of heavy enough construction. The machine was standing idle waiting for repairs for a large proportion of the time. A great deal of trouble was experienced due to the breaking of the drilling cable, causing the drilling tools to drop to the bottom of the well and necessitating long and tedious "fishing" jobs to recover them.

On April 21st the well was at a depth of 455 feet, which point was below the coal measures. At this point the size of the hole was reduced from 12 inches to 8 inches and drilling continued, it being the intention to place an eight inch casing in the 12 inch hole, thus closing off the sulphur bearing water encountered in the coal measures.

Drilling was continued until the end of the year, continual trouble being experienced with the machinery as mentioned above. On December 31st the well was at a depth of approximately 850 feet.

Miscellaneous.

On March 30, 1911, a representative of the architects and the assistant engineer in charge of designs and construction examined the walls of the dining building then under contract, in which the mortar was reported to be of inferior quality. A representative of the Woodman Lumber Company, contractors for the institution buildings, and the resident engineer for this Department were also present. A severe snow storm was in progress and the water retained in the mortar was frozen. Hot water was applied to thaw out the water in the mortar and in several of these points the mortar became so soft that it could be easily picked from the joints. As it would have been practically impossible to determine the parts of the mortar which had set sufficiently and what points were hard due to freezing, it was decided to postpone further action until later in the year when the frost had entirely disappeared. The stone-work in these walls was placed during October and the first part of November, 1910. On the north and south wings of the building the stonework was completed to the elevation of the water table and on the east wing about one-half of the stone work had been completed to the water table. The specifications required the walls to be laid in gauged mortar which is composed of equal parts of lime, mortar and cement mortar, the latter being made up of one part cement and two parts sand and the former being made up of one part cement and four parts sand. The mortar actually used in building these walls was cement mortar which the contractors state was composed of one part cement and three parts sand. A second inspection was made on April 20th, three members of the Woodman Lumber Company being present as well as a representative of the architects and the assistant engineer in charge of designs and construction and the resident engineer of the Department. All stonework was thoroughly examined and the mortar in many places was found to be soft and crumbling. As this poor mortar was scattered throughout the stonework it was deemed advisable to tear down all masonry which was not held firmly by good sound mortar. The unsatisfactory stonework removed in all amounted to about 16.6 cubic yards as outlined in the detailed table accompanying the original report. All other masonry was found to be in good condition

In tearing down the condemned portion of the work voids were found between adjacent pieces of stone which necessitated removing more masonry than would have been necessary merely on account of poor mortar. The contractor admitted that the mortar should have obtained a hard and firm set long before the date of inspection and blamed the man in charge of the mixing of this mortar for the unsatisfactory results. Three small sections had been placed at a time when the night temperature fell below the freezing point and had been condemned by the architects' superintendent, torn down and rebuilt. The upper part of this section was sound but the lower course had not been torn out and had not properly set. Accordingly this section was again torn down and the poor parts replaced. The architects, the assistant engineer in charge of designs and construction and the resident engineer were of the opinion that all the remaining mortar was in good condition and that the mortar will safely sustain all loads coming on it in the completed building.

The work of clearing the ground around the main buildings of the institution was carried on during the year by a small force of men under the direction of the resident engineer at the institution.

C—HAMBURG STATE SANATORIUM.

In the annual report for 1910 it was outlined that the chief engineer visited several localities in the vicinity of Hamburg and after a thorough inspection submitted his recommendations to the Commissioner of Health relative to the selection of a site for the State Sanatorium at Hamburg, after which the property known as the Stein Farm was selected as being the most suitable for institutional purposes. At the end of the year after the property had been purchased, preliminary estimates of cost of water works and sewerage were prepared and were included in the annual report for 1910.

Hamburg lies in the northern part of Berks County about 18 miles north of Reading on the east bank of the Schuylkill River and is reached by the Pennsylvania Railroad and the Philadelphia and Reading Railway Company. It has a population of about 2,500 and is the centre of a rich agricultural territory, has no public sewers and receives its water supply from the mountains by gravity. The institution tract is 262 acres in extent and about one mile east of the borough in Windsor Township along the State highway. The site selected for the institution buildings is about 500 feet distant from this road and 60 feet higher in elevation, sloping off abruptly to the north to the stream, the upper course of which will furnish an abundant water supply during the greater part of the year if not all of the year. This supply may be augmented by tapping the main of the Windsor Water Company which is laid in the State highway in front of the institution buildings. North of this stream the land rises again gradually to its northern boundary. A little used public road joins the main highway through the institution grounds with the farm lands and buildings of the Stein farm which it is proposed to use as a dwelling place for a State employee who will have charge of the institution grounds. A small tract of about 60 acres northeast of the main property is almost wholly wooded land but will furnish, aside from any lumber that the institution may desire, a large quantity of rock which may be used in concrete work. The two tracts are joined by a public road.

In the early fall of 1911 a study was made relative to the effect of the shadows cast by the various buildings, based upon a tentative layout of the buildings submitted by the architects. The layout included a dining building with a power and laundry wing extending to the north while east and west corridors each 100 feet in length lead to the east and west ward buildings. The axes of all buildings run north and south. As definite plans had not been prepared for these buildings at this time the heights and sizes of the various units of the group were assumed to be the same as those then under construction at Cresson and also that the first floor would be about 4½ feet above the natural grade. In these computations the declination of the sun was considered constant 23 degrees 27 minutes for the longest and shortest days of the year and zero for the equinoctial days. The property is situated about 40 degrees 30 minutes north latitude which to simplify the computations was taken to be 40 degrees, a slight difference which would be immaterial. According to the plot plan submitted by the architects the east ward building was shown 56 feet distant from the nearest part of the dining building and the west ward building 52 feet distant from the western end of the dining building. In order that the computations might represent the governing conditions, they were based on a distance of 52 feet between the dining building and the two ward buildings. Because the relative floor elevations were not determined it was thought advisable to make two sets of computations, one assuming that the dining and ward building first floor levels were to be the same and the second set assuming that the first floor level of the east ward building would be 10 feet lower than the first floor level of the dining building. Since the 22nd day of December is the shortest day of the year the shadow would be greatest on this day, which was used as a basis in the calculations. A graphic representation of the building layout was drawn up to show the line of maximum and minimum shadow cast by one building upon each of the others at various times during the day. The shadows under the same conditions were also shown on June 22nd. The shadows of the east ward building were not plotted but would be directly opposite to those cast on the west ward building. It was decided after the studies were completed that the distance between the dining building and the two ward buildings should be materially increased and a recommendation made to that effect, which was followed out in the final layout by the architects.

D—STATE INSTITUTION FOR FEEBLE MINDED OF WESTERN PENNSYLVANIA, POLK.

A description of the sewerage system and sewage disposal plant at the State Institution for Feeble Minded of Western Pennsylvania was given in the annual reports for 1908, 1909 and 1910, in which were set forth the facts that the above construction was performed under a decree of the Commissioner of Health, dated April 15, 1907, whereby the plans were prepared and construction superintended by the Engineering Division of this Department. The disposal plant has a capacity of 520,000 gallons of sewage for 24 hours and is of reinforced concrete, consisting of four preliminary treatment tanks, two sprinkling filters, a chemical dosing device, two resettling basins and a sludge field. The contract for the construction of the disposal plant was awarded to Thomas Barrett, of Wilmerding, Pa., and dated January 28, 1909. The total cost of the plant at the time of the final estimate was $26,839.58, the work being started early in the spring of 1910. Final inspection of the plant was made by the Chief Engineer of this Department, the Assistant Engineer in Charge of Designs and Construction, Thos. Fleming, Jr., and the Resident Engineer, A. H. Beard, on March 11, 1910. The final estimate was dated May 23, 1910, and on July 6th of the same year a decree was issued by this Department certifying as to the completion of the plant and containing instructions for the operation of the same.

In a report dated May 12, 1911, submitted by the present Assistant Engineer in Charge of Designs and Construction to the Chief Engineer it was stated that the provisions of the decree above mentioned have been fully carried out and the superintendent and trustees of the institution have at all times worked in harmony with this Department towards the completion of the plant. The effluent delivered from the disposal plant has been of an exceptional quality and at all times non-putrescible, while the stream below the plant shows no signs of pollution or foreign growths.

Early in the spring of 1911 the officials of the institution noticed that the concrete at several points in the plant were checking badly and showing signs of disintegration which continued so that at the time of this report many points throughout the plant exhibit pitted and chipped concrete surface to the depth of two or three inches as will be described hereafter. According to the records kept during the construction of the work, concrete was begun in May, 1909, and the last was placed on November 10th of the same year, the cement used being Bath Portland brand. The manufacturers submitted copies of mill test with each carload shipped for the work and in every case these tests show that the cement passed the requirements of the specifications. Samples of the cement taken at intervals and tests show that the cement was satisfactory. The sand used was obained near the plant and while it contained some loam and other foreign matter it was satisfactory for the work at hand. The only stone used in the aggregate was a mixture of crushed sandstone and gravel, the former being found in abundance in the locality while the latter was obtained from the bed of the creek flowing by the plant. Both sandstone and gravel were of satisfactory quality. At times there was considerable sandstone in the dust from the crusher and an allowance corresponding to this amount of dust was made for the quantity of sand used for each batch of concrete. The specifications provided for three classes of mixtures of concrete. Class "A" being of one part Portland cement, two parts sand and four parts of stone and was used in all roof slabs and in the walls of the settling tanks, including the attached siphon chamber and inlet and outlet chambers, chemical mixing tanks, chemical dosing house and the sump under it. Class "B" consisting of one part Portland cement, two and one-half parts of sand and five parts of stone, was used in the walls of the sprinkling filters and in the reinforced concrete steps. Class "C" consisting of one part Portland cement, three parts of sand and six parts of stone, was used in constructing manholes, footing for the dosing house, mixing tanks and foundations, the floors of all structures and lining of the resettling basins.

An inspector of the Department was present at all times during the mixing and placing of the concrete and the usual precautions were adopted to insure accurate measurement and thorough mixing, which was done by machinery. During hot weather the tops of all walls were covered with boards immediately after the concrete was placed to protect it from the sun. All the cncrete was placed during warm weaher excepting the roofs over the preliminary treatment tank. Concreting on these roofs was started November 6th and completed November 10th. The temperature at that time being at about freezing point, for which reason the green concrete was at once covered with a layer of straw from six to twelve inches deep. At the time of an inspection made by the writer of the report of May 12, 1911, it was noticed that all checks and signs of disintegration were above the sewage line which was especially noticeable in resettling basin No. 1 where the line of demarcation was very sharp. The side wall above the sewage surface was badly pitted while below there were absolutely no signs of checking or disintegration, proving that contact with the sewage had not caused the failures.

The concrete roofs over the preliminary treatment tanks are divided by expansion joints into blocks 16 feet square, each one of which showed signs of flaking and disintegration, especially on thirteen of the sections, the worst of which was at the southwest corner of the tank where the entire surface was badly flaked and pitted. This scaling began shortly after the completion of the work but had not progressed to any extent until the fall of 1910 when the cold weather came on and the disintegration increased until by spring the roofs were in the condition above noted. When the concrete was placed the surface was not finished at once as the material was rather wet but the roofs were allowed to dry out and the surface was then troweled late at night and on the following day. In some cases it was necessary to add a mortar wash to obtain a smooth surface. A careful examination led to the belief that the unfavorable condition of the concrete is entirely in the troweled coating for where the surface is checked off the concrete beneath is sound and hard with no visible cracks nor hair cracks after the application of water. The troweled surface where it is not chipped off is covered with small hair cracks indicating that in time the remainder of the troweling will chip and flake off. The division and side walls below the roof do not show any signs of cracks or disintegration. It has been reported by the operator that when the units are emptied for cleaning there is no leakage from one tank into the other. The concrete used in these tanks is the richest mixture specified on the work.

The roof over the siphon chamber southeast of the preliminary treatment tanks shows small cracks but it is not badly flaked. There is, however, a bad crack in the south wall of this unit which starts at a point near the bottom at the middle of the wall and extends upward at an angle of about 60 degrees to a junction with the walls of the outlet channel with the preliminary treatment tanks. The crack extends through the walls below high water line and permits considerable leakage. It is stated that the foundations under this wall at the time of construction were entirely satisfactory so that it is probable that this crack is not due to settlement. It is also stated that during the first winter this tank was filled with water to a depth of eighteen inches and that this water froze solid which may have caused an undue pressure on the walls. Since the concrete had been placed at least six weeks previous it was not believed that this freezing could have caused the crack which developed a short time after the plant was put into operation. At that time the operator chipped out and refilled the crevice with cement mortar which temporarily stopped the leakage until spring. At the time of this investigation it was noticed that the leakage on warm days when the sun is directly on the wall is considerable while on cool or windy days it is not appreciable, showing that the expansion and contraction of the wall due to changes in temperature affects the width of the crack although in a manner directly opposite to that usually developing from temperature changes.

In the sprinkling filters there has been considerable checking and disintegration of the surface during the winter, none being in evidence during the first winter that the plant was constructed. The roof over the operating gallery is badly checked and scaled for about two-thirds of its length while the middle third shows small cracks. Coping on the west wall is badly cracked and scaled while the roof of the manhole in the southwest corner of the filters is badly flaked and disintegrated, extending to a depth of two inches, and seriously weakening the roof. The roof of the manhole in the southeast corner is also badly disintegrated but not so seriously as the first mentioned. The tops of the manholes in the other two corners are just beginning to chip and flake while the coping on top of the north wall is in the same condition and also shows hair cracks and flaws, indicating that this will continue. With the exception of the southeast and southwest manhole roofs the disintegration and flaking of the concrete is on the surface and seems not to extend below the troweled portion. All of the concrete in the filters was placed during the summer. The interior walls of the operating gallery and the outside walls of the filters below the stone surface are apparently in perfect condition as well as the manhole walls below the filter stone. All of the concrete used in the filter walls and roof over the operating chamber was composed of Class "B" concrete.

The concrete in the chemical dosing house is in excellent condition and shows no signs of inferior concreting.

The roofs of the inlet manholes for both settling basins are badly disintegrated, especially in the case of the manhole for the western basin, which is disintegrated to a depth of several inches, the strength of the same being thereby seriously impaired. A section of the sloping side wall near the corner of basin No. 1 shows surface scale above the water line. Below this line no signs of deterioration are apparent while the remainder of the sloping sides is in good condition, flaking being apparent at only a few points.

The walls of the outlet trough on the south of this basin also shows signs of deterioration and is scaled and flaked off for about one-half of its length above the water line. In basin No. 2 the condition of the sloping side walls above the water line is very faulty at points scattered over the surface, but this is of very little importance at the present time. However, the wall of the outlet trough is checked and flaked very considerably, especially in the middle where a large piece two feet long has cracked off and settled so that it could be removed with little effort. The checking on this wall is serious and will undoubtedly increase.

The points above enumerated cover all of the disintegration and flaking now apparent on this work. Such a condition is unusual and when it exists is generally caused by poor materials, careless work or insufficient protection from the weather. As was pointed out in the preceding paragraphs, the materials were apparently satisfactory in all respects and an inspector was present at all times during construction so that the work received careful and thorough supervision. It is stated that all concrete was thoroughly mixed and then carefully tamped after being placed in the forms. All of the concrete except the roofs over the preliminary treatment tanks was placed during weather that could not have been injurious since the surface was protected from the direct rays of the sun. The roofs of the tanks which were placed during cool weather were protected by a coating of straw and it is not believed that this work was affected by the frost. After placing, the concrete was well wet but as far as could be ascertained this wetting was not carried on extensively during the hardening period. As pointed out, it was necessary at times to wait until the concrete was partially set before the concrete was troweled and in some cases it became necessary to add a mortar coat to secure a satisfactory surface, which is at best an unsatisfactory method as it is apt to disturb the crystals which are forming and so destroy the strength developed. It was believed after careful examination that all of the disintegration and flaking is simply on the top coating excepting the two manholes in the filters and two inlet manholes to the resettling basins together with outlet trough of basin No. 2. It was believed that the flaking had not impaired the strength of the various units. The crack in the wall of the dosing tank, while not a vital defect, causes an unsightly appearance due to leakage. This flaking of the surface and disintegration of it was believed to be in great part due to the troweling of the surfaces after the concrete had partially set and also to the fact that in some places it was necessary to add a mortar coat. The sun also may have caused a too rapid drying out of the concrete with consequent weakening effect. It was recommended upon the strength of this investigation that the crack in the south wall of the dosing tank be again widened on both surfaces and caulked with a mixture of sulphur and cement or a bituminous compound and then the remainder of the crack filled with mortar of the same proportions of cement and sand as was used in the original aggregate; that the covers in the manholes of the filters, inlet manholes to the resettling basins, and the wall of the outlet trough of basin No. 2 be removed and replaced; that all surfaces where flakes and disintegration or checking are apparent be removed with a pick or bush hammer, the surfaces then thoroughly washed and coated with a mortar of neat cement applied through a sieve or else an application to be made with an approved binder on top of which shall be placed a mortar composed of one part Portland cement and two parts sand to be floated and thoroughly troweled by an expert concrete finisher. It was stated that unless the work was thoroughly and carefully done by an experienced man it would be difficult to secure a surface coating which would not separate from the concrete beneath during cold weather. The work of chipping concrete surfaces and preparing the same for the top dressing as well as the removing of old concrete could be done by the inmates of the institution.

This work of repair was carried on as recommended by employees of the institution under direction of an engineer from this Department. All of the pitted surfaces chipped off down to sound concrete. The surface carefully cleaned and wetted and then successive coats of cement mortar were carefully troweled into place until the original surface of the old concrete was reached.

E—PENNSYLVANIA STATE ASYLUM FOR CHRONIC INSANE, WERNERSVILLE.

The disposal plant at this institution was constructed under a decree issued by the Department of Health, and the funds were supplied by an appropriation of $30,000 made by the Legislature of 1909. The construction of the plant was described in detail in the annual report for 1910 and detailed monthly estimates were also given together with an itemized schedule of all work not included in the contract which it was necessary to do before the plant was in condition for operation. Since this time the contractor has brought suit against the institution, claiming that payments allowed were not in accordance with the work actually performed and also to recover costs for the water proofing of the settling tanks which had been charged against him by the institution authorities. This case has been scheduled in the court but it was postponed and has not been tried as yet.

The entire work of construction as well as the disagreements between the contractor and the institution authorities were thoroughly reviewed in a report by the Assistant Engineer in charge of Designs and Construction, on July 29, 1911, at which time it was recommended that an inspection of the work be made by the Chief Engineer and that the institutional authorities be notified that the plant had been fully completed. It was further recommended that the plant be accepted and placed in continuous operation, subject to the following conditions and stipulations:

FIRST: That weekly reports showing the daily operation of the plant be filed with the Department.

SECOND: That bacteriological examinations be made of the effluent from the various units at intervals of not more than one week and that stabliity tests of the various effluents be made and the results of all examinations be filed with the Department.

It was the understanding at the time of these recommendations that the Trustees were to assume all responsibility for the location of the plant and to meet any objections which might be made by property holders at any time resulting from nuisances arising from the plant in this location.

Since placing the disposal plant in operation in October 1910, careful records have been kept and forwarded weekly to the Department of Health on blanks prepared for that purpose. The quality of the effluent from the several units has been satisfactory as shown by methylene blue putrescibility tests which have been made at regular intervals. These tests show that the effluents from the sprinkling filters and resettling basins, as well as the water in the creek below the outlet pipe, have been stable and non-putrescible.

16. WATER AND SEWAGE PURIFICATION.

Throughout the year a section of the Engineering Division under the charge of Assistant Engineer Ralph E. Irwin, has conducted the work of investigation and examination of the various water and sewage purification plants operating within the State. As in 1910, much time was consumed in the investigation and suppression of typhoid fever outbreaks. Twenty-five water purification plants and eighteen sewage purification plants were inspected. Nine special investigations were conducted.

Messrs. R. B. Styer, W. W. Ritter and M. H. Matthes remained as assistants throughout the entire year. Mr. Ira F. Zeigler and C. T. Maclay entered this section as assistants in field work on July 31st and August 7th, respectively. On August 1st, Mr. W. C. Wanbaugh entered this section relieving Mr. Ritter as clerk. Mr. Ritter then began field work in the eastern part of the State. On October 22nd, Frances W. Smith entered this section as a clerk and on November 1st, a typewriter was secured and Miss Smith acted as stenographer thereafter.

This section rendered assistance in the suppression of typhoid fever outbreaks in the following places. For particulars see that part of this report treating of typhoid fever outbreaks.

1. Bethlehem borough, Northampton county,
2. Marianna Borough, Washington County,
3. Millvale Borough, Allegheny County,
4. New Oxford Borough, Adams County,
5. Patton Borough, Cambria County,
6. Tarentum Borough, Allegheny County,
7. Bloomsburg, Town, Columbia County.
8. Erie City, Erie County,
9. Montgomery Borough, Lycoming County,
10. Marysville Borough, Perry County,
11. Parkers Landing City, Armstrong County,
12. Sayre and Athens Boroughs, Bradford County
13. South Bethlehem Borough, Northampton County.

Under the direction of the Chief Engineer, the following nine special investigations were made:

1. Bloomsburg, public water supply,
2. Edinboro, municipal water works application,
3. Hershey Borough, water and sewerage investigation,
4. Hanover, sewage disposal operation and efficiency,
5. Millerstown, complaint regarding the tannery of Charles Rippman & Son,
6. Phoenixville, municipal water works,
7. Saegerstown, municipal water works extension,
8. Shamokin, Edgewood Park water supply,
9. Somerset County Home and Hospital, sewage disposal operation and efficiency.

WATER PURIFICATION PLANTS.

During 1911 there were 84 water purification plants in operation and 6 under construction. Four of the 84 plants were placed in operation during the year. The 4 new plants and 21 of the plants previously operated were inspected. In each case data were secured concerning the new plants to show whether or not the plans and the stipulations of the permit for their construction had been followed. The inspection of plants that were in operation before 1911 was made to ascertain the method of operation and efficiency. Bacteriological samples were usually collected when inspections were made. Upon the results of the inspections and analyses action was taken to improve the operation and efficiency of the plants.

The four water purification plants placed in operation during 1911 were as follows:

1. Charleroi, Charleroi Water Company,
2. Jonestown, Lebanon Valley Consolidated Water Supply Company,
3. Marianna, Marianna Water Company,
4. West Pittsburg, West Pittsburg Water Co.

The water purification plants under construction during the year were as follows:

1. Brookville, Municipal Water Works,
2. New Cumberland, Riverton Consolidated Water Company,
3. Parkers Landing, Parker City Water Company,
4. Perkasie, Perkasie Water Supply Company,
5. Quarryville, Quarryville Water Company,
6. Reading, Municipal Water Works—Maiden Creek Supply.

The twenty-five water purification plants examined throughout the year were as follows:

1. Cambridge Springs, Municipal Water Works,
2. Charleroi, Charleroi Water Company,
3. Connellsville, Connellsville Water Works Co.
4. Danville, Municipal Water Works,
5. Danville, State Hospital Water Works,
6. Franklin, Municipal Water Works,
7. Freeport, Freeport Water Works Co.,
8. Indiana, Clymer Water Company,
9. Jonestotwn, Lebanon Valley Consolidated Water Supply Company,
10. Lancaster, Municipal Water Works,
11. Marianna, Marianna Water Company,
12. Middletown, Middletown and Swatara Consolidated Water Company,
13. New Castle, City of New Castle Water Company,
14. Norristown, Norristown Insurance and Water Company,
15. Pottstown, Pottstown Gas and Water Company,
16. Punxsutawney, Punxsutawney Water Company,
17. Reading, Municipal Water Works—Bernhart Plant,
18. Ridgeway, Municipal Water Works,
19. Spring Grove, P. H. Gladfelter Company,
20. South Bethlehem, Bethlehem City Water Company,
21. Sunbury, Sunbury Water Company,
22. Tarentum, Allegheny Valley Water Company,
23. Warren, Warren Water Company,
24. Washington, Citizens Water Company,
25. West Pittsburg, West Pittsburg Water Company.

Nine of the 25 plants inspected made improvements during the year according to suggestions based upon the result of the inspections. These improvements were principally for the rebuilding of filter units needing repair and cleaning, accurate chemical feeding apparatus, protection of clear water basins, the keeping of records concerning the operation of the plant and the making of fundamental chemical and bacteriological determinations. In the following table is shown the number of water purification plants making chemical and bacteriological determinations and the frequency of these analyses:

Frequency of Chemical and Bacteriological Analyses.

	Chemical	Bacterial
None,	22	15
Occasional,	35	28
Monthly,	0	2
Weekly,	5	12
Semi-weekly,	2	2
Daily,	20	25

Sixty-five of the 68 rapid sand purification plants use aluminum sulphate as a coagulant. In the past there has been a tendency to use excessive amounts of coagulant, and the same amount of coagu-

PENNSYLVANIA PUBLIC WATER PURIFICATION PLANTS, 1911.

Number.	Location and Name.	Water Furnished.	Population of district.	Number of consumers.	Million gallons consumed daily.	Source of Supply.	Water works built.	Filter installed.	Kind of Filter.	No. of units.	Total cap. in mil gals.	Sedimentation period.	Per cent. wash water.	Controller.	Re-wash.	Loss of Head gauge.	Alum coagulant.	Other Chemicals.	Analyses. Chemical.	Analyses. Bacteriological.	Reports submitted.	Miscellaneous.
1	Apollo, Apollo Water Works Co.	Apollo, Leechburg, West Apollo, Polton, Oklahoma	6,600	5,600	0.140	Beaver Run	1888	1903	Harlow slow sand	3	2.00	30 days	......	+	+	−	−	None	None	None	None	Sedimentation in dam.
2	Beaver Creek Water Co., Rutherford Heights	Shops and engines P. & R. R., Rutherford Heights	None	None	0.700	Beaver Creek	1901	1910	Pittsburgh Filter Mfg. Co., rapid sand	2	1.00	2 hours	4.0	−	−	−	+	None	None	None	None	
3	Beaver Valley Water Co., East Vale Plant	Beaver Valley towns	24,400	20,000	4.000	Beaver River	1901	6-1892; 4-1900	Jewell, rapid sand	10	5.00	1 hour	7.0	+	+	−	+	None	Occasional	Occasional	None	
4	Beaver Valley Water Co., New Brighton Plant	Beaver Valley towns	12,200	10,000	2.000	Beaver River	1879	5-1904; 2-1907	Pittsburgh Filter Mfg. Co., rapid sand	7	3.50	3 hours	7.0	+	+	−	+	None	Occasional	Occasional	None	
5	Bristol, Bristol Water Co.	Bristol borough	9,000	6,000	1.000	Delaware River	1875	1906	Jewell, rapid sand	4	2.00	2.5 hours	3.0	+	+	+	+	None	Occasional	Occasional	None	
6	Butler, Butler Water Co.	Butler borough	20,000	15,000	2.100	Connoquessing Creek and Thorn Run	1878	4-1907; 2-1903, 4-1906	American Water and Guarantee Co., rapid sand	10	5.00	None	5.0	+	−	−	+	None	Weekly	Weekly	None	Sedimentation in dam.
7	Cambridge Springs Municipal Water Works	Cambridge Springs	2,000-5,000	3,000	0.1-0.4	French Creek	1895	1903	Pittsburgh Filter Mfg. Co., rapid sand	2	1.00	1 hour	7.0	+	+	−	+	None	Weekly	Weekly	Weekly	
8	Canton, Citizens Water Co.	Canton borough and vicinity	2,500	2,000	0.400	Mill Creek and Nephawin Lake	1879	1899	N. Y. Cont. Jewell, rapid sand	1	0.25	12 hours	......	−	−	−	+	None	Occasional	Occasional	None	
9	Carlisle, Carlisle Gas and Water Co.	Carlisle borough	10,000	10,000	1.000	Conodogwinet Creek	1854	1896	Morison Jewell, rapid sand	3	1.20	None	5.0	+	+	−	+	None	Occasional	Occasional	None	Sedimentation in dam.
10	Charleroi, Charleroi Water Co.	Fallowfield township	11,700	11,700	0.850	Monongahela River	1890	1911	Chester, Fleming, rapid sand	6	1.00	3.5 hours	4.0	+	+	+	+	Sodium carbonate	Daily	Occasional	None	
11	Chester, New Chester Water Co.	Chester and suburbs	42,000	39,000	5.000	Delaware River	1863	12-1903; 6-1908	Roberts and Hodkinson, rapid sand	13	10.00	30 hours	1.3	+	+	−	+	None	Occasional	Weekly	Weekly	
12	Clarion, Clarion Water Co.	Clarion borough	2,600	2,600	0.350	McLains Run and drilled wells	1875	1902	N. Y. Cont. Jewell, rapid sand	1	0.75	3 hours	......	+	+	−	+	None	Occasional	Occasional	None	
13	Columbia, Columbia Water Co.	Columbia borough	11,500	11,000	1.000	Susquehanna River	1826	1902	Pittsburgh Filter Mfg. Co., rapid sand	4	2.00	4 hours	11.0	+	+	+	+	None	None	Monthly	None	
14	Connellsville, Connellsville Water Works Co.	Connellsville and suburbs	14,600	12,400	1.000	Youghiogheny River	1898	1900	N. Y. Cont. Jewell Press., converted to gravity	3	2.75	4 hours	5.0	−	+	−	+	Calcium oxide	Occasional	Daily	None	About 20% supply unfiltered.
15	Danville Municipal Water Works	Danville borough	7,500	7,000	1.600	N. Branch, Susquehanna River	1873	1905	Morison, Jewell, rapid sand filter	2	1.50	20 min.	......	−	+	−	+	None	Occasional	Occasional	None	
16	Danville State Hospital Water Works	State Hospital for Insane	1,700	1,700	0.250	N. Branch, Susquehanna River	1900	1-1903; 1-1906; 2-1909	Jewell and Amer. Soft Co., rapid sand	4	1.60	45 min.	......	+	+	−	+	None	Occasional	Occasional	None	
17	Eaglesmere, Eaglesmere Water Works	Eaglesmere borough	800	800	0.100	Eaglesmere Lake	1902	1910	Roberts Filter Mfg. Co., rapid sand	1	0.50	None	......	+	+	−	−	None	Occasional	Occasional	None	
18	Elizabeth, Monongahela Valley Water Co.	Monongahela Valley towns	17,500	14,000	1.400	Monongahela River	1895	1901	N. Y. Cont. Jewell, pressure as gravity	3	2.25	12 hours	4.0	−	+	−	+	Calcium oxide	Occasional	Weekly	None	
19	Elwood City, Elwood Water Co.	Elwood City and suburbs	4,600	3,800	2.600	Slippery Rock Creek	1892	1910	Chapin, rapid sand	4	4.00	4 hours	4.0	−	+	−	+	None	Occasional	Occasional	None	
20	Enola, Dauphin Consolidated Water Co.	Enola borough	1,000	970	0.100	Susquehanna River and wells	1905	1908	Roberts, rapid sand	1	0.04	2 hours	5.5	−	−	−	+	None	None	None	None	Well water not filtered.
21	Ernest, Jefferson and Clearfield Coal and Iron Co.	Ernest village	1,800	1,600	0.050	McKees Run	1907	1907	Pittsburg Filter Mfg. Co., rapid sand	1	0.50	4 hours	7.1	+	+	−	+	None	None	None	None	
22	Franklin Municipal Water Works Co.	Franklin and suburbs	11,000	8,000	0.800	French Creek and wells	1865	1908	Greer, rapid sand	4	2.00	2 hours	2.0	+	+	−	+	Calcium oxide	Occasional	Occasional	None	Well water not filtered.
23	Freeport, Freeport Water Works Co.	Freeport and suburbs	2,600	2,400	0.500	Allegheny River	1884	1909	Greer, rapid sand	2	1.00	5 hours	5.5	+	+	+	+	None	None	None	Weekly	
24	Gettysburg, Gettysburg Water Co.	Gettysburg borough	4,000	3,900	0.400	Marsh Creek and wells	1847	1894	Warren, rapid sand	1	0.40	5 hours	......	−	−	+	+	None	Occasional	Weekly	Monthly	
25	Harrisburg Municipal Water Works	Harrisburg and few suburbs	70,000	70,000	11.000	Susquehanna River	1843	1905	Pittsburg Filter Mfg. Co., rapid sand	12	12.00	8 hours	2.0	+	+	+	+	Calcium oxide chlorinated lime	Weekly	Daily	None	
26	Holmesburg, Philadelphia and Bristol Water Co.	N. Phila. suburban wards	30,000	20,000	2.000	Sandy Run and Pennypack Creek	1888	1-1888; 8-1893; 2-1907	N. Y. Cont. Jewell and Roberts Pressure	6	3.00	24 hours	......	−	+	−	+	None	Occasional	Occasional	None	
27	Hummelstown, Hummelstown Consolidated Water Co.	Hummelstown and part Swatara twp.	20,000	8,000	1.500	Swatara Creek	1887	1909	Pittsburg Filter Mfg. Co., rapid sand	4	2.00	8 hours	2.0	+	+	−	+	None	Occasional	Weekly	Weekly	
28	Huntingdon, Huntingdon Water Supply Co.	Huntingdon and suburbs	7,500	6,600	1.000	Standing Stone Creek	1885	6-1908; 6-1910	A. P. Malgnen, semi slow sand	12	0.50	2 hours	......	−	−	−	−	None	None	None	None	
29	Indiana, Clymer Water Co.	Indiana borough	6,700	5,000	0.500	Two Lick Creek	1896	1908	Roberts Filter Mfg. Co., rapid sand	2	1.00	None	......	−	+	−	+	None	Occasional	Occasional	None	
30	Iselin, Pittsburgh Gas and Coal Co.	Iselin village	1,600	1,500	0.040	Hoopers Run and Blackleg Creek	1904	1906	Pittsburg Filter Mfg. Co., rapid sand	1	0.06	None	......	+	+	−	+	None	None	None	None	Sedimenintion in dam.
31	Jenkintown, Moreland Spring Water Co.	Jenkintown and vicinity	5,000	2,000	0.450	Pennypack Creek and artesian wells	1909	1910	Roberts Filter Mfg. Co., rapid sand	3	1.50	3 hours	6.0	+	+	+	+	Chlorinated lime	Occasional	Weekly	Weekly	
32	Jonestown, Lebanon Valley Consolidated Water Supply Co.	Lebanon and suburban district	25,000	8,000	0.800	Big Swatara Creek	1910	1911	C. E. Shaup, rapid sand	8	3.00	4 hours	2.0	+	+	+	+	None	Occasional	Weekly	Weekly	
33	Kittanning, Armstrong Water Co.	Kittanning and Wickboro	9,000	7,500	1.200	Allegheny River	1871	1905	A. P. Malgnen, semi-slow sand	5	2.00	24 hours	......	−	+	−	+	None	None	None	None	
34	Lancaster Municipal Water Works	Lancaster and suburbs	50,000	48,000	7.000	Conestoga Creek	1888	1906	A. P. Malgnen, semi-slow sand	15	9.00	2.25 hours	......	−	+	+	+	Calcium oxide chlorinated lime	Occasional	Daily	None	
35	Marianna, Marianna Water Co.	Marianna borough	1,200	1,200	0.125	Ten Mile Creek	1908	1911	Pittsburg Filter Mfg Co., rapid sand	2	0.50	4 hours	......	+	+	+	+	None	Weekly	Daily	Monthly	
36	McKeesport Municipal Water Works	McKeesport City	42,800	42,000	4.000	Youghiogheny River	1883	1908	Pittsburg Filter Mfg. Co., rapid sand	6	6.00	10 hours	0.6	+	+	+	+	Calcium oxide	Weekly	Daily	Weekly	Also use sodium carbonate and chlorinated lime—water softening plant.
37	Mechanicsburg, Mechanicsburg Gas and Water Co.	Mechanicsburg and suburbs	5,000	4,500	0.600	Yellow Breeches Creek and springs	1858	1909	Pittsburg Filter Mfg. Co., rapid sand	1	0.50	6 hours	......	+	+	+	+	None	None	None	None	
38	Media Municipal Water Works	Media, Moylan, Wallingford	6,000	5,500	0.500	Ridley Creek	1854	1898-1901	Witherill Pressure, rapid sand	3	1.00	None	......	−	+	−	+	None	Occasional	Occasional	None	Sedimentation in dam.
39	Middletown, Middletown and Swatara Consolidated Water Co.	Middletown and suburbs	6,000	6,000	0.650	Swatara Creek and Iron Mine Run	1885	1910	C. E. Shaup, rapid sand	2	1.00	2 hours	1.0	+	+	+	+	None	None	Weekly	Weekly	
40	Monessen, Monessen Water Co.	Monessen and suburbs	12,000	12,000	1.750	Monongahela River	1899	1905	Pittsburg Filter Mfg. Co., rapid sand	4	2.00	24 hours	......	+	+	−	+	Calcium oxide	Occasional	Occasional	None	
41	Monongahela, Monongahela City Water Co.	Monongahela and vicinity	8,000	5,800	0.530	Monongahela River	1857	1904	Scaife, rapid sand	4	2.00	1.5 hours	6.8	−	+	−	+	None	None	Occasional	None	
42	Natrona, Natrona Water Co.	Harrison twp., Allegheny Co.	6,500	5,000	0.400	Springs and Allegheny River	1908	1910	W. B. Scaife and Sons, rapid sand	2	0.50	3 hours	12.0	+	−	−	+	None	None	None	None	Spring water not filtered.
43	New Bethlehem, Citizens Water Co.	New Bethlehem and vicinity	2,100	1,500	0.150	Red Bank Creek	1883	1-1899; 1-1906	N. Y. Cont. Jewell and Reisert, rapid filter	2	0.80	10 hours	2.0	+	+	−	+	Sodium carbonate	Daily	None	None	Raw water averages 12 p. p. m. acidity.
44	New Castle, City of, New Castle Water Co.	New Castle City	36,600	36,000	3.500	Shenango River	1882	8-1893; 4-1904	N. Y. Cont. Jewell and Am. W. & G. Co., rapid sand	12	5.00	6 hours	5.5	−	+	−	+	Calcium oxide	Daily	Daily	None	
45	Newport, Home Water Co.	Newport and vicinity	2,000	2,000	0.125	Juniata River	1893	1909	C. E. Shaup, rapid sand	1	0.25	3 hours	8.0	+	+	−	+	None	None	Weekly	Weekly	In operation only part time.
46	Norristown, Norristown Insurance and Water Co.	Norristown and Bridgeport	35,000	33,030	2.000	Schuylkill River	1847	1901	N. Y. Cont. Jewell, rapid sand	8	4.00	2.5 hours	3.0	+	+	+	+	None	Occasional	Occasional	None	
47	North East Municipal Water Works	North East borough	2,600	2,500	0.125	Sixteen Mile Run and springs	1886	1908	Hungerford-Terry Pressure, rapid sand	1	0.30	None	6.0	−	+	+	+	None	Occasional	Occasional	None	Sedimentation in dam.
48	Philadelphia Municipal Water Works, Upper Roxborough Plant	Philadelphia City	70,000	70,000	20.000	Schuylkill River	1869	1904	Slow sand	8	20.00	8 hours	......	+	+	+	−	None	Daily	Daily	None	
49	Philadelphia Municipal Water Works, Lower Roxborough Plant	Philadelphia City	160,000	160,000	26.000	Schuylkill River	1869	1908	Slow sand	66	40.00	24 hours	......	+	+	+	−	None	Daily	Daily	None	
50	Philadelphia Municipal Water Works, Belmont Plant	Philadelphia City	50,000	50,000	12.000	Schuylkill River	1869	1902	Slow sand	6	12.00	24 hours	......	+	+	+	−	None	Daily	Daily	None	
51	Philadelphia Municipal Water Works, Torresdale Plant	Philadelphia City	950,000	950,000	223.000	Delaware River	1907	1907	Slow sad	13	240.00	None	......	+	+	+	−	None	Daily	Daily	None	
52	Philadelphia Municipal Water Works, Queen Lane Plant	Philadelphia City	270,000	270,000	68.000	Schuylkill River	1895	1910	Slow sand	22	70.00	2.6 hours	......	+	+	+	−	None	Daily	Daily	None	
53	Pittsburgh Municipal Water Works	Port of greater Pittsburgh	533,000	250,000	70.000	Allegheny River	1828	1906-1909	Slow sand	46	49.00	20 hours	......	+	+	+	+	None	Daily	Daily	None	
54	Pottstown, Pottstown Gas and Water Co.	Pottstown and suburbs	17,000	16,000	2.200	Schuylkill River	1869	1909	N. Y. Cont. Jewell, rapid sand	6	4.00	2.5 hours	......	+	+	−	+	Chlorinated lime	Occasional	Occasional	None	
55	Punxsutawney, Punxsutawney Water Co.	Punxsutawney and Big Run	10,000	9,000	0.900	Clover Run and Mahoning Creek	1867	1910	Greer Pressure, rapid sand	4	2.00	6 hours	......	+	+	+	+	None	Occasional	Occasional	None	
56	Reading Municipal Water Works, Egleman Plant	Part of Reading City	8,500	3,000	0.320	Spring Run	1903	1900	Slow sand	3	0.60	16 hours	......	+	+	+	+	None	Daily	Daily	Weekly	
57	Reading Municipal Water Works, Antietam Plant	Part of Reading City	43,500	13,000	3.100	Antietam Creek	1830	1905	Slow sand	3	3.50	None	......	+	+	+	−	None	Daily	Daily	Weekly	
58	Reading Municipal Water Works, Bernhart Plant	Part of Reading City	44,000	23,600	3.200	Bernhart Creek	1821	1910	Slow sand	6	3.75	3 hours	......	+	+	+	−	None	Daily	Daily	Weekly	
59	Ridgeway Municipal Water Works	Ridgeway borough	6,500	5,000	1.000	Big Mill Creek	1888	1908	Roberts Filter Mfg. Co., rapid sand	2	1.00	2 hours	......	+	+	−	+	None	None	None	None	
60	Royersford, Home Water Co.	Royersford and Spring City	5,900	5,000	0.400	Schuylkill River	1889	1893	Morse and Jewell, rapid sand	3	1.25	2.5 hours	......	−	+	−	+	None	None	None	None	
61	St. Benedict, St. Benedict Water Co.	St. Benedict village	800	700	0.030	Rock Run	1903	1904	Norwood Engr. Co., Pressure, rapid sand	1	0.15	None	......	+	−	−	+	None	None	None	None	
62	Sayre and Athens, Sayre Water Co.	Sayre and Athens boroughs	10,500	9,500	1.500	North Branch, Susquehanna River	1884	1904	Robt. Witherill Co. Pressure, rapid sand	8	4.00	None	......	−	−	−	+	None	None	Occasional	None	
63	Scranton, Scranton Gas and Water Co.	Scranton, Providence district	130,000	60,000	6.000	Leggett Creek	1869	1910	N. Y. Cont. Jewell, rapid sand	6	6.00	40 min.	......	+	+	+	+	None	Daily	Daily	Weekly	
64	Sharon, Sharon Water Works Co.	Sharon and South Sharon	25,000	20,000	2.000	Shenango River	1883	4-1900; 4-1903	Pittsburg Filter Mfg. Co., rapid sand	8	4.00	3 hours	......	+	+	−	+	Calcium oxide	None	Monthly	None	
65	South Pittsburgh, South Pittsburgh Water Co.	South Pittsburgh and vicinity	90,000	60,000	6.000	Monongahela River	1895	1905	Am. Water and Guarantee Co., rapid sand	14	14.00	17 hours	2.0	+	+	+	+	Calcium oxide iron sulphate	Daily	Daily	None	
66	South Bethlehem, Bethlehem City Water Co.	South Bethlehem and vicinity	25,000	23,000	2.800	Lehigh River	1885	1904	A. P. Malgnen, semi-slow sand	6	6.00	4 days	......	......	+	+	−	None	Occasional	Weekly	None	
67	Springfield Consolidated Water Co., Neshaminy Falls Station	Philadelphia suburban towns	25,000	18,000	1.800	Neshaminy Falls Creek	1910	1910	J. W. Ledoux Pressure, rapid sand	4	2.00	48 hours	......	......	−	−	−	None	Daily	Daily	Weekly	
68	Springfield Consolidated Water Co., Pickering Creek Station	Philadelphia suburban towns	33,000	26,400	1.680	Pickering Creek	1897	1897	Warren, rapid sand	8	2.40	60-72 hours	......	−	−	−	+	None	Daily	Daily	Weekly	
69	Springfield Consolidated Water Co., Pickering Creek Station	Philadelphia suburban towns	22,000	17,600	1.120	Pickering Creek	1897	1897	Slow sand	3	1.50	60-72 hours	......	+	−	−	−	None	Daily	Daily	Weekly	
70	Springfield Consolidated Water Co., Springfield Station	Philadelphia suburban towns	80,000	60,000	4.200	Crum Creek	1896	1896	J. W. Ledoux, pressure rapid sand	10	5.40	48 hours	......	......	−	−	−	None	Daily	Daily	Weekly	
71	Spring Grove, P. H. Gladfelter Co.	Spring Grove borough	1,500	1,500	0.120	W. Branch Codorus Creek	1884	1895	Warren and Norwich Eng. Co., rapid sand	13	5.00	None	......	−	+	−	+	None	Occasional	Occasional	None	Sedimenintion in dam.
72	Steelton Municipal Water Works	Steelton borough	14,000	14,000	2.600	Susquehanna River	1908	1908	J. H. Fuertes, slow sand	3	3.00	15 min.	4.0	+	+	+	+	Calcium oxide chlorinated lime	Daily	Daily	Monthly	
73	Sunbury, Sunbury Water Co.	Sunbury borough	14,000	12,500	3.000	Little Shamokin C. and Susquehanna R.	1884	6-1904; 2-1907	Pittsburg Filter Mfg. Co., rapid sand	8	4.00	1.25 hours	4.0	+	−	+	−	None	None	None	None	
74	Tarentum, Allegheny Valley Water Co.	Tarentum and vicinity	11,500	13,000	2.500	Allegheny River	1886	1906	Roberts Filter Mfg. Co., rapid sand	6	3.00	2 hours	......	+	+	−	+	None	Occasional	Occasional	None	
75	Vandergrift, Vandergrift Water Co.	Vandergrift and vicinity	4,000	3,500	0.600	Artesian wells	1895	2-1897; 1-1906	N. Y. Cont. Jewell and Roberts, rapid sand	3	1.50	30 min.	......	+	+	−	−	None	Occasional	Occasional	None	
76	Washington, Citizens Water Co.	Washington and suburbs	20,000	14,000	1.200	Tributary Chartiers Creek	1887	1902	Pittsburg Filter Mfg Co., rapid sand	4	3.00	12 min.	10.0	−	−	−	+	None	Occasional	Occasional	None	Sedimentation in dam.
77	Warren, Warren Water Co.	Warren City	11,000	8,000	1.500	Morrison Run and Allegheny River	1882	1905	Am. Water and Guarantee Co., rapid sand	6	3.00	2.6 hours	3.3	+	+	+	+	None	Daily	Daily	None	
78	Waynesburg, Waynesburg Water Co.	Waynesburg and vicinity	5,000	1,000	0.100	Big and Little Ten Mile Run	1888	1902	Pittsburg Filter Mfg. Co., rapid sand	2	1.00	None	......	−	−	−	+	None	Occasional	Occasional	None	
79	West Pittsburgh, West Pittsburgh Water Co.	West Pittsburgh and vicinity	500	600	0.040	Beaver River	1902	1911	W. B. Scaife, rapid sand	2	0.24	4-5 hours	......	+	+	+	+	Chlorinated lime, sodium carbonate	Occasional	Occasional	None	
80	West Reading, West Reading Water Co.	West Reading and Wyomissing	2,500	2,500	0.150	Schuylkill River	1885	1896	Warren, Jewell, rapid sand	1	0.80	0.5 hours	3.0	−	+	−	+	None	None	None	None	
81	Wilkinsburg, Pennsylvania Water Co.	Wilkinsburg and vicinity	75,000	70,000	9.000	Allegheny River	1888	1910	Pittsburg Filter Mfg. Co., rapid sand	10	10.00	7 hours	2.6	+	+	+	+	None	Daily	Daily	Monthly	
82	Wilkes-Barre, Spring Brook Water Supply Co.	Wilkes-Barre and suburbs	100,000	70,000	8.000	Huntsville Water Shed	1857	1895	Morison, Jewell, rapid sand	20	8.00	None	......	−	+	−	−	None	Semi-weekly	Semi-weekly	None	
83	Wilkes-Barre, Spring Brook Water Supply Co.	Wilkes-Barre and suburbs	60,000	60,000	6.000	Crystal Lake Water Shed	1857	1895	Morison, Jewell, rapid sand	12	6.00	None	......	−	+	−	−	None	Semi-weekly	Semi-weekly	None	Peat colored water.
84	York, York Water Co.	York and suburbs	60,000	55,000	4.200	S. Branch Codorus Creek	1816	1899	N. Y. Cont. Jewell, rapid sand	12	9.00	10 days	2.0	+	+	+	+	Chlorinated lime	Daily	Daily	Weekly	

lant has been added to both clear and turbid waters. While making an inspection of the rapid sand plants the Department has in many places endeavored to reduce the amount of coagulant and to have the amount vary according to turbidity. In some cases it has been necessary to increase the sedimentation period and in others to add alkalies to turbid waters that there would be sufficient alkalinity to react with the acid coagulant. Eight purification plants are now using chlorinated lime. This germicide has brought about a reduction in the amount of coagulant used in connection with rapid sand filtration. The various chemicals used and the number of plants using each are as follows:

Aluminum sulphate,	65
Calcium oxide,	11
Chlorinated lime,	8
Sodium carbonate,	3
Iron sulphate,	1
No chemicals,	19

The permits issued by the Commissioner of Health for the construction of water purification plants usually require that the officials in charge of the plant shall make reports to the Department of Health concerning the operation and efficiency of the purification plants as operated by them. At the present time 18 water purification plants report to the Department of Health each week and 4 report each month.

The accompanying chart shows the location and name of each of the 84 water purification plants together with the name of the district in which water is furnished, population of the district, number of consumers, million gallons consumed each day, source of supply, date when the water works were built and the purification plant installed, the kind of filter used, number of filter units in each plant, number million gallons capacity, sedimentation period, the frequency with which analyses and reports are made and data concerning the equipment of the plant and the chemical used in treating the water.

INSTRUCTIVE INFORMATION CONCERNING WATER PURIFICATION IN PENNSYLVANIA.

From the chart submitted it appears that there are 84 water filtration plants furnishing water to the public within the State of Pennsylvania. In construction these 84 purification plants represent three types as follows:

Slow sand,	12
Semi slow sand,	4
Rapid sand,	68
Total,	84

The following table shows the capacity and delivery of each type of plant:

Capacity,	12	Slow sand plants,	445.35 Mil. gals. or	67.47%
Capacity,	4	Semi slow sand plants,	17.80 Mil. gals. or	2.70%
Capacity,	68	Rapid Sand plants,	196.89 Mil. gals. or	29.83%
Total capacity,	84	Filtration plants,	660.04 Mil. gals. or	100.00%
Delivery,	12	Slow sand plants,	444.33 Mil. gals. or	76.76%
Delivery,	4	Semi slow sand plants,	12.00 Mil. gals. or	2.07%
Delivery,	68	Rapid sand plants,	122.54 Mil. gals. or	21.17%
Total delivery,	84	Filtration plants,	578.87 Mil. gals. or	100.00%

Nineteen of the 84 water purification plants are operated by municipalities and 65 are operated by companies. The 19 municipal filtration plants have a capacity of 475.55 million gallons, which is 72.05% of the total capacity of the 84 plants. The municipal plants deliver 472.00 million gallons, which is 81.54% of all water filtered. The 65 company plants have a capacity of 184.49 million gallons, which is 27.95% of the total capacity of the 84 plants. The company plants deliver 106.87 million gallons, which is 18.46% of all water filtered.

During 1911 four new water filtration plants were placed in operation. These plants are all of the rapid sand type and all are operated by companies.

The four new plants have a total capacity of 4.74 million gallons and a total delivery of 1.82 million gallons. These new plants increase the total capacity over 1910 by 0.72% and the total amount delivered by 0.31%.

The population of the State of Pennsylvania according to the 1910 census is as follows:

Total State population,	7,665,111
Total urban population,	4,630,669 or 60.41 per cent.
Total rural population,	3,034,442 or 39.59 per cent.

The population of the districts in which filter plants are operated is 3,611,900 or 47.12% of the total population and 78.00% of the urban population.

The population of these districts served by the three types of filter plants is as follows:

District population served by slow sand plants,	2,171,600 or 60.12 per cent.
District population served by semi slow sand plants,	91,500 or 2.53 per cent.
District population served by rapid sand plants,	1,348,800 or 37.35 per cent.

The population receiving filtered water, known as consumers, is 3,071,450 or 40.07% of the total population and 66.33% of the urban population.

The consumers are served filtered water from the three types of plants as follows:

Consumers served by slow sand plants,	1,937,600 or 63.08 per cent.
Consumers served by semi slow sand plants,	85,000 or 2.77 per cent.
Consumers served by rapid sand plants,	1,048,850 or 34.15 per cent.

The population of the districts served by the four new filtration plants is 38,700. This is an increase over 1910 of 1.08%. The population receiving filtered water from the four new plants is 21,500. This is an increase over 1910 of 0.70%.

The district population served by the 19 municipal and 65 company filtration plants according to type is as follows:

District population served by municipal slow sand plants,	2,143,000 or 91.54 per cent.
District population served by municipal semi slow sand,	50,000 or 2.14 per cent.
District population served by municipal rapid sand plants,	148,100 or 6.32 per cent.
District population served by company slow sand plants,	28,600 or 2.25 per cent.
District population served by company semi slow sand,	41,500 or 3.27 per cent.
District population served by company rapid sand plants,	1,200,700 or 94.48 per cent.

Municipal plants serve a district population of 2,341,100 or 64.82%. Company plants serve a district population of 1,270,800 or 35.18%. Municipal plants serve 2,105,600 consumers or 68.55%. Company plants serve 965,850 consumers or 31.54%.

The number of consumers receiving filtered water from the three types of municipal and company water purification plants is as follows:

Consumers served by municipal slow sand plants,	1,914,500 or 90.92 per cent.
Consumers served by municipal semi-slow sand,	48,000 or 2.28 per cent.
Consumers served by municipal rapid sand plants,	143,100 or 6.80 per cent.
Consumers served by company slow sand plants,	23,100 or 2.39 per cent.
Consumers served by company semi-slow sand,	37,000 or 3.83 per cent.
Consumers served by company rapid sand plants,	905,750 or 93.78 per cent.

The source of water supply for the 84 filtration plants and the number of municipal and company plants using each source are designated in the following tables:

Sources.	Municipal.	Companies.	Total.
Rivers,	10	26	36
Small streams,	7	28	35
Streams and wells,	1	4	5
Rivers and small streams,	0	2	2
Streams and springs,	1	1	2
Rivers and springs,	0	1	1
Small streams and lakes,	0	2	2
Wells,	0	1	1
Total,	19	65	84
Surface water only,	17	58	75
Ground water only,	0	1	1
Combined surface and ground water,	2	6	8
Total,	19	65	84

The sources of water supply for the district population receiving filtered water from municipal and company plants are shown in the following table:

Sources.	Municipal.	Companies.	Total.
Rivers,	2,167,000	515,100	2,682,100
Small streams,	160,500	699,200	859,700
Streams and wells,	11,000	12,600	23,600
Rivers and small streams,	0	25,000	25,000
Streams and springs,	2,600	5,000	7,600
Rivers and springs,	0	6,600	6,600
Small streams and lakes,	0	3,300	3,300
Wells,	0	4,000	4,000
Total,	2,341,100	1,270,800	3,611,900

In the following table is shown the source of water supply used by each of the three types of filtration plants and the district population and number of consumers served by each type:

	Population of District.	Consumers.
Twelve slow sand plants using surface waters,	2,171,600	1,937,600
Slow sand plants using ground waters and using ground and small stream waters,	none	none
Four semi-slow sand plants using surface waters,	91,500	85,000
Semi-slow sand plants using ground waters and using ground and small stream waters,	none	none
Fifty-seven rapid sand plants using surface waters,	1,307,000	1,015,800
Eleven rapid sand plants using ground waters and using ground and small stream waters,	41,800	33,050

SEWAGE DISPOSAL PLANTS.

There were 55 sewage purification plants in operation within the State in 1911. Thirteen sewage disposals were placed in operation during the year and six were under construction. An inspection was made of 18 of the disposals in operation. The inspections were made to learn the construction method of operation and efficiency of the plant.

In the following table is designated the 55 sewage purification plants in operation during the whole or a part of the year 1911:

1. Allegheny City Home, Allegheny County.
2. Allegheny County Work House, Allegheny County.
3. Altoona City, Blair County.
4. Allan Wood Iron & Steel Company, Ivy Rock Station, Montgomery County
5. Bryn Athyn Village Association, Moreland Township, Montgomery County.
6. Chester Springs Soldiers' Orphans' School, Chester County.
7. Devon Drainage Company, Devon, Chester County.
8. Derry Borough, Westmoreland County.
9. Dermady Sanatorium, Morton, Delaware County.
10. Dormont Borough, Allegheny County.
11. Doylestown Sewerage Company, Doylestown, Bucks County.
12. East Stroudsburg, A. R. Brittain, owner, East Stroudsburg, Monroe County.
13. Enola Sewerage Company, Enola, Cumberland County.
14. Hanover Sewer Company, Hanover, York County.
15. Haverford College, Haverford Township, Delaware County.
16. Home and Hospital of the Good Shepherd, Radnor Township, Delaware County.
17. House of Refuge of Eastern Pennsylvania, Middletown Township, Delaware County—Girls Department.
18. House of Refuge of Eastern Pennsylvania, Thornbury Township, Delaware County—Boys Department.
19. Indiana Borough, Indiana County.
20. Jewish Sanatorium for Consumptives, Eagleville, Lower Providence Township, Montgomery County.
21. J. W. and A. P. Howard Tanning Co., Corry, Erie County.
22. Lehigh County Home and Alms House, South Whitehall Township, Lehigh County.
23. Morrisville Rubber Works, Morrisville, Bucks County.
24. Mount Gretna Park, Mount Gretna, Lebanon County.
25. Nelson Valve Co., Springfield Township, Montgomery County.
26. New Jersey Zinc Co., Palmerton Village, Carbon County.
27. New Wilmington Borough, Lawrence County.
28. North Western Anti-Tuberculosis League, Bells Camp, Foster Township, McKean County.
29. Palmer Land Company, Palmerton Village, Carbon County.
30. Perkasie Borough, Philip Cressman owner, Perkasie, Bucks County.
31. Pennsylvania Glue Co., Springdale, Allegheny County.
32. Perkiomen Seminary, Pennsburg, Montgomery County.
33. Pittsburg Municipal Water Works at water purification plant near Aspinwall, Allegheny County.
34. Pennsylvania State South Mountain Sanatorium, Mont Alto, Franklin County.
35. Reading City, Berks County.
36. Schuylkill County Home and Hospital, near Schuylkill Haven, Schuylkill County.
37. Soldiers' Orphans' Industrial School, Scotland, Franklin County.
38. Somerset County Home and Hospital, Somerset, Somerset County.
39. South Wayne, Radnor Township, Delaware County.
40. State Asylum for the Chronic Insane, South Mountain near Wernersville, Berks County.
41. State Hospital for the Insane, Danville, Montour County.
42. State Hospital for the Insane, Norristown, Montgomery County.
43. State Institution for the Feeble Minded, Polk, Venango County.
44. State Lunatic Hospital, Harrisburg, Dauphin County.
45. State Institution for the Feeble Minded and Epileptic, Spring City, Chester County.
46. Stoneham Tannery—Elk Tanning Co.—Stoneham, Warren County.
47. Tressler Orphan Home, Loysville, Perry County.
48. Villanova College, Villanova, Delaware County.
49. White Haven Sanatorium, Free Hospital for Poor Consumptives, White Haven, Luzerne County.

50. Williamson Trade School, Middletown Township, Delaware County.
51. Wayne Sewerage Company, Wayne, Delaware County.
52. Washington Borough, Washington County.
53. Warren Water Company at filtraiton plant, Warren, Warren County.
54. Willow Grove Park, Moreland Township, Montgomery County.
55. Willow Grove, Parkside Hotel, Moreland Township, Montgomery County.

The six plants under construction are as follows:

1. Chambersburg Borough, Franklin County.
2. Malvern Rush Hospital, Willistown Township, Chester County.
3. Montgomery County Home for the Poor, Montgomery County.
4. Pennsylvania Reform School, Morganza, Washington County.
5. Philadelphia City, Pennypack District.
6. St. Francis Industrial Home, Eddington Station, Montgomery County.

The 13 average disposals placed in operation during the year of 1911 were as follows:

1. Dormont Borough, Allegheny County.
2. Doylestown Sewerage Co., Doylestown, Bucks County.
3. East Stroudsburg, A. R. Brittain owner, East Stroudsburg, Monroe County.
4. Indiana Borough, Indiana County.
5. Lehigh County Home and Alms House, South White Hall Township, Lehigh County.
6. New Wilmington Borough, Lawrence County.
7. North Western Anti-Tuberculosis League, Bells Camp, Foster Township, McKean County.
8. Perkasie Borough, Philip Cressman owner, Perkasie, Bucks County.
9. Perkiomen Seminary, Pennsburg, Montgomery County.
10. Schuylkill County Home and Hospital near Schuylkill Haven, Schuylkill County.
11. South Wayne, Radnor Township, Delaware County.
12. State Hospital for the Insane, Norristown, Montgomery County.
13. State Lunatic Hospital, Harrisburg, Dauphin County.

The 18 sewage purification plants examined during the year were as follows:

1. Allegheny City Home, Allegheny County.
2. Allegheny County Work House, Allegheny County.
3. Derry Borough, Westmoreland County.
4. Doylestown Sewerage Co., Doylestotwn, Bucks County.
5. Hanover Sewer Co., Hanover, York County.
6. Indiana Borough, Indiana County.
7. Mount Gretna Park, Mount Gretna, Lebanon County.
8. New Wilmington Borough, Lawrence County.
9. Perkasie Borough, Philip Cressman owner, Perkasie, Bucks County.
10. Penna. Glue Co., Springdale, Allegheny County.
11. State Hospital for the Insane, Danville, Montour County.
12. State Hospital for the Insane, Norristown, Montgomery County.
13. State Institution for the Feeble Minded and Epileptic, Spring City, Chester County.
14. Schuylkill County Home and Hospital, near Schuylkill Haven, Schuylkill County.
15. Washington Borough, Washington County.
16. Wayne Sewerage Company, Wayne, Delaware County.
17. White Haven Sanatorium—Free Hospital for Poor Consumptives, White Haven, Luzerne County.
18. Williamson Trade School, Middletown Township, Delaware County.

Water Sample Collections.

During the year 6,310 water samples were collected under the direction of the Engineering Division. Four thousand six hundred and forty-three of these samples were collected by Departmental officers in the making of 63 investigations. These investigations include those made in relation to typhoid fever outbreaks. Nine hundred and eighty-four samples were collected at six State Institutions to show the efficiency of the water and sewage purification plants at those places. Eight hundred and eighty-three samples were collected by individuals from 78 places. These samples were collected in almost every instance by those using water from individual water supplies suspected of having caused typhoid fever or some other water borne disease.

17. SPECIAL WORK.

During the year the Department collected a series of samples of water in the streams above and below the Devon Drainage Company's sewage disposal plant located in the outskirts of Easttown Township, Chester County. Also samples of sewage for bacteriological analyses preparatory to instituting legal proceedings against this drainage Company for the abandonment of the sewage works. The Department also made surveys and plans and collected other data and in December the case was tried at the Court House in West Chester, but no decision had been handed down by the court at the end of the year.

At Muncy borough, Lycoming County, during the summer there was a shortage of water at the source of supply back in the hills, and the Muncy Water Company had recourse to the emergency pumping station and intake on the banks of the Susquehanna River. The Commissioner of Health was notified by said company that this would be done and the Commissioner directed that the water obtained indirectly from the river should be first subjected to sterilization with a chemical. Assistant Engineer Moses went to Muncy and supervised the installation of a germicidal plant.

At the village of Lynch, Howe Township, Forest County, there was an outbreak of anthrax among cattle. Assistant Engineer Hooker went there to supervise the incineration of some of the carcasses and to see that burial of other carcasses had been made in a proper manner.

During the year relief work was performed at Austin after the flood caused by the failure of the Bayless Pulp and Paper Company dam on Freemans Run.

The Chief Engineer made a special investigation of the water works system and and filtration plant at the city of Lancaster, resulting in decrees being issued by the Commissioner of Health to both the city and the Lancaster Water Filtration Company.

In Hershey village, Derry Township, Dauphin County, the wells, springs and public water supply, the sources of which were from limestone formations, developed pollution and menaced the community, and a special investigation, the treating of the public supply and the closing up of some of the private wells resulted.

Protective measures were taken respecting the water supply at the Mt. Gretna Military Encampment.

A source of water supply for the new Western Penitentiary being erected in Centre County, was recommended.

Detail reports relative to these special and important operations are given in the following pages.

A. NOTES MADE AT AUSTIN BY THE CHIEF ENGINEER DURING THE RELIEF WORK OF THE STATE DEPARTMENT OF HEALTH, AFTER DEMOLITION OF DAM AND DESTRUCTION OF TOWN BY FLOOD.

a.—State Relief Work.

On September 30th, 1911, a large dam owned by a manufacturing corporation collapsed and a flood swept down the valley of Freemans Creek, devastating the valley and destroying the larger part of the borough of Austin and causing 73 deaths. Commissioner of Health Dixon rushed a flying squad of his officers, consisting of physicians, nurses and engineers to the scene of the disaster. He followed the next morning as soon as supplies were *en route* to the scene of disaster and took charge of the relief work in person.

Saturday, September 30th, 1911.

About 7 o'clock Saturday evening, September 30th, 1911, the Chief Engineer received telephone orders from the Commissioner of Health, who was then at Bryn Mawr, to at once make preparations to go to Austin, Potter County, where, owing to the breaking of a dam, the town had been destroyed by flood and the services of the Department were required. The Chief Engineer at once assembled a working force of engineers and inspectors. Dr. Thomas H. A. Stites communicated with district nurses, county medical inspectors and Department surgeons. Mr. Wm. B. McCaleb, Superintendent of the Pennsylvania Railroad stationed at Harrisburg, assigned a special passenger coach and reserved all untaken berths and state rooms on the Buffalo and Erie night train leaving Harrisburg at 10.57 that evening, and the party, consisting of Dr. Stites, the Chief Engineer and Assistant Engineers, Emerson, Moses, Hooker and Riddle, went out on this train. Mr. Farley Gannett, Chief Engineer of the State Water Supply Commission, was accommodated as one of the party. There were picked up on the way at stations all along the line, doctors and nurses, and when the train arrived at Keating Summit early on Sunday morning, there were in the party, Drs. Philips, Bashore, Plank, MacMullen, Douglass, Flowers, Williams, Simmons, Malone, Tule, Trainer and Sullner, and the following nurses: Hatfield, Butler, McClure, Roth. Shellenberger, Woyler, Hillman, Rebuck, Smith, Simmons, Garman and Vottorf The following newspaper men were also accommodated: Mr. Bonbright, Harrsiburg. Clark and Tobin of the Philadelphia Bulletin, Maclay and Armenger of the Philadelphia Times and Davis of the Inquirer. Later, Mr. Charles Fry followed to Austin as Chief Time Keeper, assisted by Glace and Williams of the Engineering Division. Mr. Ness also followed and served as stenographer for the party. Field inspectors Templeton, Engle, Tiffany, Zellers, Whelan, Jarrett, Nicholson, Thompson and Claypool reported for duty as soon as ordered.

The special coach was detached from the train at Keating Summit and taken via the Buffalo and Susquehanna Railroad into Austin, and at 6.30 Sunday morning the party arrived at Austin.

Sunday, October 1st.

Passenger coaches were placed on a side-track outside of the borough for sleeping quarters. Suitable quarters were found for the nurses in dwellings on the hillside that had not been destroyed by the flood.

At the time of the arrival of the party early Sunday morning there was practically nothing known of the actual situation in Austin. Telephonic and telegraphic communication with the outer world was practically severed. It was vaguely rumored (and all kinds of reports were in circulation) that but few of the buildings remained standing, in the town and that most of these were being destroyed by fire. It was anticipated that many dead and injured might be found, the living would have to be cared for and prompt service would have to be rendered in the recovery of the bodies of the dead. In order to ascertain at once the actual facts of the situation to place before the Commissioner of Health, the party was divided into squads that separated and covered the different sections of the town. They returned to the coach by 8 o'clock in the morning. The Chief Engineer made a sketch of the two valleys and of the topography and geography of Austin borough and surrounding territory, showing approximately the location of the dam that had failed, the course of the flood, etc., and this information was used to further the plan of movement of the squads.

Assistant Emerson aided by Mr. Riddle was assigned to the preliminary duty of covering the town to make observations relative to all such affairs as might require the removal of wreckage in the search for bodies, the temporary housing of recovered bodies, the location and adequacy of burial grounds, the recovery and disposition of dead animals, the employment of labor, the transportation and purchase of materials and supplies, the housing of the living, and such other matters usually accompanying constructive work applicable to the emergency in hand.

Mr. Hooker was assigned to the investigation of the water supply, fuel, sewage and waste disposal matters. He was assisted by Mr. Moses.

The Chief Engineer at once searched out the town officials and found the Burgess, Michael Murran, and some of the citizens who had resolved themselves into a relief committee, assembled on the lawn in front of Odd Fellows Hall. These citizens were of course overwhelmed by the misfortune and in dire straits for assistance. There was no food in the town, all stores had been washed and the water works system was in ruins; many persons were insufficiently clothed, having lost all their possessions; the kindling wood factory had caught fire and was smouldering in ashes; three fire companies from surrounding towns with their apparatus had been working all night and were in an exhausted and famished condition; the railroad station and yards were washed away and train service and transportation were confined to the one track switch from Keating Summit. There was but one side-track remaining and that a very short one on the line just in the outskirts of the upper portion of the borough, thus absolutely limiting railroad operations. There was no order or semblance of order. The Chief Engineer told the Burgess and the citizens gathered on the lawn that the Commissioner of Health had sent the coach load of physicians, nurses and engineers to Austin as an advance guard; that he, the Commissioner, would follow in a few hours; that a relief train with stores would arrive that forenoon; that the State Police would come in and preserve order and that laborers would follow and the State would take charge. At that time it was estimated by the Burgess that 300 human beings had perished. The situation was desperate.

There were some men at work hauling over wreckage early Sunday morning. Pilfering was going on. The town constable attempted to appoint deputies to assume charge of the property and stop pilfering and take charge of the work of turning over the wreckage and recover the bodies, pending the arrival of State forces; but it practically amounted to nothing so far as effective organization was concerned.

A little before 8 o'clock Sunday morning the squads returned to the coach and it was reported by the physicians and nurses that there were none sick or injured with four or five exceptions and these unfortunates were being cared for in the hospital on the hill where there were ample facilities and accommodations. The concensus of opinion was that there was nothing to do but to care for the necessities of the living and recover the bodies of the dead and carry out other general sanitary work not requiring physicians or nurses.

Mr. Hooker reported the water supply and sanitary conditions as he found them and started to do work under the direction of the Chief Engineer, making temporary repairs to the water works system and closing up practically all suspicious private sources of water and looking after the disposal of sewage and garbage.

Mr. Emerson reported his findings of the situation but as the work involved the expenditure of a lot of money, the Chief Engineer waited to get into communication with the Commissioner of Health to receive instructions. The only phone in town was at the Buck residence. The rooms, hallway and lawn outside were crowded with citizens answering calls for intelligence from the outside or endeavoring to send some message to relatives. The Chief Engineer insisted on the right of the Department to the first use of the wire but about this time the service went out of commission. At 9 o'clock Dr. Stites and the Chief Engineer walked up Freemans Creek valley to near the dam where at an inn a phone was in partial service.

The Chief Engineer returned to Austin and at 10.45 Sunday morning met Major Maurice Finney in charge of the State relief train sent out by Adjutant General Thomas J. Stewart. Lieutenant Wm. E. Mair in charge of a company of State Police also arrived on this train as did Dr. B. Franklin Royer, Chief Medical Inspector of the Department.

Briefly, the situation was explained to these military officers and within a half hour patrol lines were established and order prevailed and all general pilfering was stopped. Major Finney brought food, overcoats, mattresses and cots. The nurses started at once to prepare coffee and sandwiches in the kitchen of the Odd Fellows Building and by night everybody in Austin had been furnished with sandwiches and coffee. Furthermore, some provisions were sent out to householders who were without supplies. Sunday afternoon the rain came down in torrents steadily.

The Bell Telephone Company had brought in a large force of men and were endeavoring to set up an exchange in a building across the flats on the east hill above Costello Avenue. When the Commissioner of Health arrived at 6.30 Sunday evening, telephone communication had not been established between Austin and the outside world.

Sunday afternoon Captain J. F. Robinson arrived with a second company of State Police and he took charge of this branch of the service. In spite of the rain a number of men kept at work in a desultory manner in turning over the wreckage in the search for bodies. The men who were doing the work were volunteers and nothing had been said about pay for labor. The Buffalo and Susquehanna Railroad Company had a gang of its own at work in Austin clearing away the wreckage on its property in and below the town. The Goodyear Lumber Company had a gang of men at work at the company's mill. During Sunday forenoon the Pennsylvania Railroad had a large train wrecking crew at work overhauling the wreckage in the search for bodies. Several bodies were recovered Sunday afternoon and deposited in the temporary morgue. So at the conclusion of the first day's presence of the State officials in Austin, order had been established, with the help of the local Hospital many had been fed, the better housing of some had been arranged, the care of dead bodies had been placed under proper supervision and supplies were coming in from the Department and other charitable sources as the result of Dr. Dixon's efforts during Saturday night in directing the obtaining and shipping of what was needed, and of the readiness with which the merchants responded to a call to put on night shifts to facilitate prompt delivery. The Commissioner made a night inspection of the situation, depending upon the light from the burning buildings situate just below the town.

Monday, October 2nd.

Early Monday morning direct telephone service was available and organization for work perfected. The Commissioner of Health announced that the State would pay $1.75 per day for labor of ten hours and he fixed the compensation for teams, carpenters, mechanics and he authorized the purchase of requisite materials and tools. The Goodyear Lumber Company had a force of about 75 men at work during the day and the Pennsylvania Railroad planned to send in a crew of workmen on Tuesday. By Monday night there were over 500 laborers at work under State organization. Twenty-three bodies had been recovered. Mattresses and blankets were purchased and ordered shipped in by the Commissioner.

Tuesday, October 3rd.

A Pennsylvania Railroad crew under supervision of S. H. Kuhn arrived in their own bunk cars with provisions for 3 days and all necessary tools and went to work early in the morning. The men were experts picked for the purpose and they performed very satisfactory service. The State Police established a more vigilant patrol line refusing to permit any person to pass through the line without an order from the Commissioner of Health. The owners of property certified by the town's relief committee, were permitted on the issuance of a pass by the Commissioner of Health to remove articles recovered from the wreckage. The Bell Telephone Company's force was still on the ground improving the telephone service about town. Division Engineer, S. W. Jackson of the State

Highway Department, reported that he would remove wreckage from the State highway in Austin and work in harmony with the regulations of the Commissioner of Health.

Assistant Engineer, H. E. Moses, was detailed to Costello to take up his permanent quarters there and supervise the relief work in the lower portion of the valley. Facilities for housing and feeding laborers were established and instructions to ship listed rations for the sustenance of the Costello forces were phoned to Mr. Way, of DuBois, who had volunteered his services in collecting materials, supplies and laborers there and in the surrounding country. A special train over the Buffalo and Susquehanna Railroad arrived at 8 P. M. at Costello with about 120 men in charge of Mr. Milton Alcorn.

At Austin a large quantity of dynamite previously ordered by the borough was taken charge of by the Department and removed from the village to an unused spring house up the valley of a tributary of Freemans Creek in the west end and a watchman was placed in charge.

Lewis T. Furman, Mayor of Buffalo and Wm. E. Robinson, President of the Chamber of Commerce, sent men from that city. The crew arrived in the afternoon. Men from the surrounding towns came in to work. They were housed in as favorable quarters as could be found and were fed at Odd Fellows Hall. Some of the men employed Monday found the work too strenuous and gave it up. On Tuesday night there were on the State's payroll over 450 men. Gangs were distributed in numbers of about 20, each under a foreman. There were urgent demands for teams and tackle, wagons and drags and the country round about was scoured for teams. Mr. Edward Ballou was given supervision over the teams and he rendered efficient service day and night. The transportation of men to Austin over the railroads was arranged for.

In the evening Governor John K. Tener and party came in on a special train. An account of the inspection made by these visitors maybe found in the special report of the Commissioner elsewhere in this book.

Wednesday, October 4th.

Department inspectors as they came in were assigned to their several duties. Food and clothing were distributed at Costello to families that were in need but who had previously declined to make their wants known and both at Costello and Austin, laborers were coming and going. The housing of the men was one of the difficult problems with which to contend but at no time was a man without a mattress and blanket. Major Finney, by request of the Commissioner of Health, took charge of the supplies of this kind and he gave them out on requisition to the inspectors of the Department who had in immediate charge the work of housing and distribution.

The second crew from Buffalo which arrived late Tuesday night were given better accommodations Wednesday. The Commissioner of Health accepted a proposition from the General Electric Company of Schenectady to install a temporary electric light plant to assist in the work of wreckage removal. The town of Austin used gas for fuel as well as lighting. The gas pipes in that portion of the west end of the borough not affected by the flood were put in condition for use Sunday afternoon and by Monday night gas service was established in all habitable houses, but the gas company could not supply the devastated districts and hence the necessity for the emergency electric light plant.

During the day the Lackawanna Steel Company of Buffalo sent Supt. F. W. Bond with a crew of 45 men to Austin. This crew remained ten full days and did splendid work. Mr. Bond was appointed by the Commissioner of Health to act as General Superintendent over all the foremen and laborers in the employment of the Department.

On Wednesday the new mess tent erected by Major Finney on the flats was put in commission and a system of meal tickets was established, and at this place from Wednesday forenoon all laborers were fed. Dr. Dixon and staff continued to obtain their meals in the kitchen at the Odd Fellows Hall and from this place provisions were handed out to the towns people until the Commsisioner of Health left Austin.

On Wednesday Mr. S. W. Foster, Chief Engineer of the State Highway Department, arrived and gave directions about the wreckage work on the State highway and about co-operation with the Commissioner of Health.

Before this time all matters in relation to a pure water supply and of garbage and sewage disposal had been looked after; they are elsewhere described, as also the work supervised by Mr. Emerson.

Thursday, October 5th.

During Thursday evening a crew of 86 men from Buffalo under Mr. Fred Leigh arrived. This gang was sent by the Chamber of Commerce. They were to be paid by the Commissioner of Health.

From DuBois men had been coming in daily, so that by Wednesday 183 men were employed at Costello.

All this time the Goodyear Lumber Company had men employed in piling up lumber belonging to said company on their property and in the valley below. But some of the Lumber Company men had been working in the State gangs. During Thursday a canvass of the entire Lumber Company's men was made to be sure that the State was not paying for men engaged in work only for the company and the Commissioner of Health conferred with the company's superintendent relative to the matter. Thursday night 50 bodies had been recovered.

Friday, October 6th.

Early Friday morning some of the DuBois men at Costello struck for shorter hours. The Commissioner of Health and Captain Robinson at once went to Costello. The strikers were paid off and their places were filled. Friday night 188 men were working at Costello; at Austin 460 men were on the Health Department's payroll; 56 for the Bayless Company; 69 for the Goodyear Lumber Company; 185 for the highway company; 45 in the Lackawanna Steel Company's crew and in the neighborhood of 100 men for the Buffalo and Susquehanna Railroad Company. Furthermore, a great many private citizens were engaged in looking after their own property or occupied in working for their neighbors in the recovery of property.

Saturday, October 7th.

During this day quite a number of laborers returned to their homes with a promise to come back to Austin to work. Others were paid off and left for good. During Saturday considerable trouble was experienced with some of the Buffalo men. Those who refused to adhere to the agreement to work six days were not given transportation back to Buffalo but they were paid off. Some of the men who promised to return on Monday to work did not show up and consequently a great deal of trouble was encountered in paying these men as they did not call for their wages until long after the Department had left Austin. Saturday night Mr. Kuhn's gang of the Pennsylvania Railroad was withdrawn. The crew were experienced track workers and could no longer be spared by the company. Saturday evening Mr. Roe, Division Engineer of the Pennsylvania Railroad and other railroad officials had a conference with the Commissioner of Health about any further service that the company might render the Department.

Sunday, October 8th.

A train up the valley of the Sinnemahoning Creek came into Costello Sunday morning with 410 men. They were volunteers from the railroad shops at Renovo. They worked during the day and returned home that night. Another special train from the Pennsylvania Railroad arrived at Austin Sunday morning via Keating Summit with 128 men. At this time the gangs under the Department's employ were changing daily, men coming and going, and without an exception, men who were concluding their work were paid off if they took the trouble to come to headquarters. However, some of them resigned and went home and later wrote for their wages.

Sunday evening a new Pennsylvania Railroad crew came in under the charge of Foreman Davis, in all, a force of 99 men. At this time the larger majority of the laborers were not citizens of Austin.

Monday, October 9th.

During Monday an agreement was reached with the Bayles Company about the payment by said company of their former employes working under the Department in rescue work.

Tuesday, October 10th.

George S. Beal, Superintendent of the Pennsylvania Railroad, had conferred with the Commissioner of Health on this day and that night all railroad crews were withdrawn.

Some of the Buffalo men threatened to strike and were discharged.

Wednesday, October 11th.

The first passenger train coming up the valley of the Sinnemahoning to Costello and thence to Austin arrived to-day and thereafter service was maintained. Commissioner Dixon after a review of the entire situation from Austin to Costello called a meeting of the representatives of the different State Departments to discuss the possibility of his closing up the work of the Department of Health on October fifteenth. The meeting adjourned without taking any action while it was understood that the Commissioner would push the work with a view of retiring from the command on the following Sunday, the day already proposed. The first step taken to that end was the following letter handing over the water works to the Borough.

"Austin, October 11, 1911.

"To the Honorable,
"The Burgess and Towns Council,
"Austin, Pa.

"Gentlemen: The borough water works system prior to the flood comprised the Austin Springs, the spring near the pumping station as the principal sources and several drilled wells about town from which water was raised by air lift, all of the water being delivered to the receiving well at the Main Street pumping station from whence it was forced through the distributing pipe system laid in the streets of the borough, the overflow going to a masonry reservoir of 235,000 gallons capacity located on Goodyear Hill, by means of which a pressure of 125 pounds was maintained in the major portion of Austin on the flats. About 40 fire hydrants were located at selected points.

"The Commissioner of Health issued a permit in 1906 to the borough to acquire an additional source of supply from the Vanetta Springs located about one mile up the west branch of Freemans Creek from the town. The Department is not informed as to whether these springs have been taken over by the borough but there is an old 6-inch wooden pipe extending from them down the valley into the village in the public highway south of the creek. This line was not supplying water except to a few houses in the west portion of the town along the line Below these houses the pipe line was cut off and plugged. Whether this was done by the Potter County Water Company, alleged owner of the 6-inch pipe, is not known to the Department.

"On Sunday morning, October 1st, 1911, when officers of the State Department of Health arrived in Austin, there was no water anywhere in the town in the public system. The people had to resort to private springs and wells. These were examined, dangerous sources were placarded and verbal notices were given, to boil all water. The flood had swept away the hydrants in the devastated districts, wreckage covered the gates on the pipe lines remaining intact, the pumping station contained debris and mud and the pumps required some repairs. The pipe line from the Austin springs was broken but some water was flowing into the pump well. These springs were filled up with mud and covered over with buildings washed there by the flood, and the air lifts at the wells were broken.

"By Monday night the system in the west end had been put into use and gravity water from the Vanetta Spring was being supplied at Odd Fellows Hall and in the district above it. A hose line attachment had been made from the old wooden pipe near the gate hereinbefore mentioned to a hydrant on the public system. A chemical sterilizing plant was installed and is in use now whereby the Vanetta spring water is subjected to treatment. All water from the spring supplied to the public has been thus treated.

"By Wednesday the gravity service had been extended to the mess tent on the flats and to all buildings between the mess tent and Odd Fellows Hall, including all dwellings south of Freemans Creek.

"On October 9th the pumping machinery at the station had been put into shape for use and by means of a 4-inch pipe line 550 feet long laid from near Odd Fellows Hall to the station, Vanetta spring water was available to be pumped into the water works system then in use in event that fire service were demanded, the gravity pressure being only about 25 pounds.

"Easterly of the creek on Goodyear Hill there has been no public water supply owing to the impossibility of fixing up the gates, hydrants and pipe lines on the flats. It is believed that the 8-inch force main from the station to the reservoir on Goodyear Hill is intact and that it will be in service this evening in which event Vanetta spring water can be pumped into said reservoir, giving fire pressure in all of the water works system at present in use in the borough. Slight repairs in plugging hydrants easterly along Costello Avenue will extend the service to that portion of the borough and this is true with respect to the north part of the town east of Freemans Creek.

"All of the work the Department has done has been in the nature of emergency work to supply pure drinking water and to give fire protection. A spring on the hill was temporarily turned into a gravity supply to the hospital and adjacent buildings on October 2nd. Tomorrow these buildings can be put on the public service.

"With the above explanation I now wish to hand over to your care the operation and maintenance of the public water works system and on and after 24 hours from the time this communication is placed in your hands, we shall cease to operate your water works system or to continue to repair the same, but we will advise with you. Vanetta spring water only should be used until you can show to the satisfaction of the Commissioner of Health that the other sources are pure and wholesome and suitable for the public supply.

"Yours truly,

"SAMUEL G. DIXON,
"Commissioner of Health."

Thursday, October 12th.

Transportation away from Austin was furnished to a large number of men during this day. The Commissioner notified all private companies in Austin that on and after Friday noon, October 13th, the State would feed only those who were on the payroll of the State.

Friday, October 13th.

The working force was largely diminished on this day. The Department began the final paying off of the men. The following communication was sent to the Burgess:

Austin, October 13, 1913.

"To the Burgess and
Members of Council,
"Austin, Pa.

"Gentlemen: On October 2nd, the water from a small spring, the only water available for the purpose, was turned into the equalizing reservoir on Goodyear Hill and temporarily used as an emergency gravity supply serving the Austin Hospital and several nearby houses, pending completion of repairs to the borough system. On said date the users of the water were warned not to use it for drinking or culinary purposes without first boiling it, owing to possible pollution. Analyses have since shown positive evidence of pollution and the use of this spring should be at once discontinued as per instructions given to your Water Works Superintendent Sick.

"A much used roadside spring on the south side of Costello Avenue has been found to be seriously polluted by sewage. This spring should be immediately and effectually closed so that its waters cannot be used for domestic purposes.

"Samples of water from the following four private springs or wells have been found to contain sewage organisms and the use of these waters should be at once discontinued unless and until the sources of pollution shall be ascertained and entirely removed.

"Spring at Cumming's residence on Keating Summit Road.

"Well at residence of George Huit, adjoining Odd Fellows Hall.

"Spring at rear of Emanuel Seyler's residence on Burdette street.

"Spring at rear of vacant house next door west of Setler's residence.

"These sources of supply have been placarded with warning notices.

"The waters of numerous other springs similarly placarded throughout the borough should not be used for domestic purposes without first boiling at least twenty minutes.

"Very truly yours,
(Signed) "SAMUEL G. DIXON,
"Commissioner of Health."

Saturday, October 14th.

The Commissioner of Health gave notice that he would close up the headquarters and withdraw from Austin sometime the following day. The time sheets were made up with this in view; transportation was furnished many laborers and at the close of Saturday night all but 36 men had been stricken from the payroll.

Sunday, October 15th.

At 8 o'clock Sunday evening the Commissioner of Health and his force, and Major Finney and his staff, withdrew from Austin to Harrisburg, having concluded all field work. Affairs were left in charge of the borough officials and the Austin Relief Committee; a few State police remained.

The following table gives the men employed at Austin, under the direction of the State Commissioner of Health in searching for dead bodies and in general sanitary work:

October.	Health Dept.	Highway Dept.	Paper Company.	Goodyear Lumber Company.	Lackawanna St. Co.	P. R. R.	Miscellaneous.
Sunday 1,	0	0	0	30	....	78	....
Monday 2,	355	0	83	69	....	0	....
Tuesday 3,	455	14	83	69	....	99	....
Wednesday 4,	398	189	80	59	45	99	....
Thursday 5,	493	191	57	68	45	99	....
Friday 6,	459	185	56	69	45	99	....
Saturday 7,	429	173	39	68	45	99	....
Sunday 8,	304	167	34	64	45	0	538
Monday 9,	392	182	39	60	45	99	....
Tuesday 10,	356	133	41	67	45	99	....
Wednesday 11,	385	107	54	41	45	....	....
Thursday 12,	404	42	44	39	45	....	215
Friday 13,	212	....	....	....	45	....	....
Saturday 14,	137	....	....	....	....	....	....
Sunday 15,	36	....	....	....	....	....	....

There were many more men working on Sunday than shown in the table. Those given were organized. The Pennsylvania Railroad crew were fed and lodged by the railroad at the train. The State fed all of the others, and the citizens quite generally. There were other men employed about town by private individuals. The Paper and Lumber Company kept men at work after October 12th.

In the following table is given a summary of the men employed in Austin, Costello and by the Buffalo and Susquehanna Railroad on their own repair work in the borough and the valley, the latter number being estimated:

October.	Austin.	Costello.	B. & S. R. R.	Grand Total.
Sunday 1,	108	....	30	138
Monday 2,	507	....	125	632
Tuesday 3,	720	117	125	962
Wednesday 4,	880	138	125	1,143
Thursday 5,	953	183	125	1,261
Friday 6,	914	188	125	1,227
Saturday 7,	853	207	125	1,185
Sunday 8,	1,152	187	125	1,464
Monday 9,	817	197	125	1,139
Tuesday 10,	741	153	125	1,019
Wednesday 11,	632	148	125	905
Thursday 12,	790	138	125	1,053
Friday 13,	266	125	125	516
Saturday 14,	137	119	125	381
Sunday 15,	36	6	125	167
Monday 16,	....	4	......	4

The work of the different divisions was so interlocked that it is difficult to separate it in the following brief account which includes reconstructing work, Homeless citizens of the town were sheltered in the remaining houses of the borough on the hillside or else they moved to surrounding towns and villages. Two large school houses were situated on the hill near the hospital. The benches were removed and the rooms used for sleeping quarters by a large number of workmen. Some of the vacant houses in the borough were also utilized for this purpose. No temporary quarters had to be erected for housing.

All of the roads leading into the former business section of the borough were blocked with wreckage. They were opened as soon as possible and lines of communication were established. The bridge across Freemans Run at Main Street had been carried away preventing transportation from one side of the valley to the other. A temporary wagon bridge was constructed across this stream. There was at this time no place in Austin where carpenters tools could be purchased and all local carpenters had lost their tools in the flood. Sunday night Mr. Emerson went to Emporium Junction and purchased everything necessary in this line. They were brought back to Austin over the road. On October 3rd a force of 16 carpenters were at work on the construction of the bridge. It was completed late that night. A tool house was built that day and also movable tool boxes. Temporary privies were erected about town.

The second floor of the Odd Fellows Hall, used as headquarters where crowds of persons gathered, was found to be in a shaky condition and it was braced. The lumber for this purpose was donated by the Emporium Lumber Company. On October 6th a stable to shelter the ten horses belonging to the State Police was erected. The same day tables and benches were built for the mess tent. The next day serving tables were erected in the mess tent and flooring laid in the supply tent to keep the food stuff off the ground.

A temporary blacksmith shop was built as this was found to be an emergency necessity and a temporary barn to shelter the horses in the employ of the Department had to be erected. It was a shelter shed nearly 30 feet square, provided with a roof but without sides.

Because of the lack of railroad sidings, great difficulty was experienced, due to congestion of teams in the limited space, so a small bridge was built across the west branch of Freemans Run to provide a loop. A storage shed for clothing being disbursed by the State was erected on October 9th.

On October 10th, a roof over the receiving well at the water works pumping station on Main Street was built to protect the purity of the water.

The carpenters were laid off on the night of October 10th. Numerous small jobs were done but all in connection with the State work and not for the benefit of private citizens. Among other things, 30 sleds for hauling wreckage were constructed. The bracing of the upper portion of some of the buildings that were likely to give away from force of wreckage in the rear as the debris from the streets was removed, was done under the direction of the carpenters.

The Commissioner decided upon a temporary telephone line from Austin to Costello.

Mr. Moses' work was largely confined to Costello where he superintendended field operations under the direct supervision of the Commissioner. Capt. Robinson and two of his troopers made frequent inspections along the five-mile line of activities taking in Costello.

Assistant Engineer Riddle divided his time between Mr. Emerson and Mr. Hooker from day to day as the work progressed.

With respect to Mr. Hooker's work it might be well to note that the water supply of Austin prior to the dam failure and flood, is described elsewhere in report of operations of the Department for the year 1911, under the heading of typhoid fever at Austin.

The following is copied from Assistant Engineer Hooker's report of the Department's operations relative to water works immediately after the flood.

"On Sunday morning, October 1st, it was found that the Starkweather, the Whittaker and the Vannetta spring systems remained intact. Some of the springs along Freeman's Creek valley, which has been used locally, were covered with debris or otherwise disturbed. The Standard Wood Company's plant was destroyed. The receiving basin and portions of the plant of the Potter County Water Company, not recently used, were damaged and strewn with wreckage, rendering this source of supply unavailable for immediate use.

"The public water works system was entirely out of commission. The springs were filled up or covered with debris, the supply pipe to the pumping station broken, the air lifts at the wells destroyed, the receiving basin at the pumping station and the station itself somewhat damaged and filled with debris and throughout the devastated area, fire hydrants and house connections were broken off, although for the most part the mains were unbroken and appeared to have suffered little damage.

"The distributing system in the portion of the borough south of Main street and east and north of Freeman's creek was uninjured, except for the destruction of fire hydrants and several house connections along Costello avenue. The portion west of the postoffice and south of Freeman's Creek suffered no damage, except in the vicinity of the pumping station.

"The inhabitants were, for the most part, obtaining water for domestic purposes from conveniently located springs or wells, some of which had previously been condemned by local or state authorities and others were so located as to be of suspicious quality.

"Beginning on Sunday and continuing thereafter as rapidly as possible all springs and streams likely to be used which appeared on inspection to be suspicious as to quality of the water were placarded with warning signs and those who were necessarily dependent upon those sources were cautioned to boil all water used for drinking or culinary purposes.

"With the regular sources of supply rendered temporarily and perhaps permanently useless it was necessary to look elsewhere for water to supply the immediate needs of the people. A small spring slightly higher than the equalizing reservoir was found and its water diverted by means of a wooden trough into the reservoir and thence supplied to the Austin hospital and several houses on the same line. The water being liable to pasturage pollution, the users were warned not to use it for culinary or drinking purposes without first boiling it. The limited capacity of the spring and the arrangement of the piping system prevented further extension of this service which was put in operation on Sunday, October 1st.

"It was ascertained that the original pipe leading from the Vannetta spring to the water company's pumping station passed in close proximity to one of the public water mains and that on both lines there were fire hydrants. The old supply line had been cut at a point in the western part of the town. This pipe was repaired, a valve lower down on the line was closed, a hose connection made between fire hydrants on each line and Vannetta spring water delivered into the western part of the borough system at about 6 P. M. October 2nd. The next day the service was extended to a point just east of the pumping station. On October 4th, at 9 P. M., a temporary line 600 feet long was completed to supply water to the mess tent.

"In addition to serving the large number of persons from other towns engaged in relief work, who from the first used mainly public water, this supply was furnished on October 1st to 71 persons in ten properties, on October 2nd to 300 persons in 54 properties, on October 3rd to 484 persons in 85 properties and on October 15th to 1015 persons in 179 properties. On the 15th there remained unconnected only 14 dwellings with 77 occupants formerly served with public water.

"Before turning water into the public system, a pipe leading from an unknown source into the Vannetta spring collecting basin was severed, the water in the basin itself was treated with chloride of lime, one part to a million, and apparatus installed for the temporary treatment of the water continuously with the same dose. This installation was deemed advisable as a precautionary measure and not because of any known source of possible pollution.

"The pumping station was cleaned out. The receiving basin nearby was cleaned and disinfected and a temporary 4-inch pipe line laid along the surface of the ground from the old Vannetta spring supply line in Foster street, a distance of 550 feet to the receiving basin. This last arrangement made it possible for the Vannetta spring water to be pumped directly into the system for fire protection, the gravity pressure being only about 20 pounds maximum. The 8-inch main extending from the pumping station through Main street across the devastated area to the reservoir and the eastern part of the borough was flushed out and the hydrants and service connections closed or plugged as rapidly as removal of debris permitted. The same work was carried on along Costello Avenue and on October 14th for a short time and continuously after October 15th, first by gravity pressure and then by pumping directly, the Vannetta spring water was supplied to all the remaining habitable portions of the borough, except the isolated portions at the northern end. On the 15th the treatment apparatus was removed from the sources of supply and installed at the pumping station and instructions given that its use be continued, at least, until the extension of service through the remaining portions of the town had been completed in order that any of the old pipe to be placed in service might be thoroughly flushed with disinfected water. Later instructions required that treatment be not discontinued without written permission from the Commissioners of Health.

"Beginning on October 5th samples of the various waters used by the people of Austin for domestic purposes were taken and analyzed at the Department's laboratories at Philadelphia. As previously noted, a number of springs had been placarded upon inspection of their surroundings. Others were later placarded upon the evidence of analysis. On October 12th a communication relative to some of these springs was delivered to the borough. This communication has been quoted hereinbefore.

"On Sunday, October 1st, Elmer Sick, Superintendent of the water works at Austin was employed by the Department as foreman and given instructions to get the necessary number of men to carry on the work of securing a safe supply of water for the public. An average of 7 men were used continually on this work until noon of October 12th when the system was turned over to the borough authorities. The men then stopped work for about 24 hours pending a guarantee by the borough of the payment of wages to the workmen. When this was adjusted, work was resumed and on the night of October 15th when the Department withdrew from Austin the system was in good shape to supply treated Vannetta spring water under pressure to the greater part of the townspeople.

"A measurement of the flow of the Vannetta spring was made on October 7th and found to be 180,000 gallons per day, although it is reported that the flow is considerably less at times. Preliminary steps were taken with the view of securing an additional supply. In this connection an attempt was made to ascertain the source of water flowing from the pipe formerly entering the Vannetta spring basin but cut off on October 1st. This was supposed to come from the covered "Goodyear" spring 200 feet distant but the connection could not be verified in the limited time available. Another possible source of supply tentatively considered is the so-called Cold spring and wells formerly operated by the Potter County Water Company. This plant was partly damaged and satisfactory samples of the water cannot be taken until some cleaning up shall have been done and the wells pumped for a time. It is understood that the borough authorities will follow the suggestion of the Department officials that these two possible available sources of supply be further investigated. An assistant engineer remained at Austin for some time after October 15th, advising and assisting the borough in the permanent restoration of its water works system.

"With respect to the sanitary conditions prior to the disaster of September 30, 1911, the inhabitants of Austin were poorly supplied with sewerage facilities. About 50 dwellings were connected with the one public sewer and its laterals which extended from Freeman's creek just below Main street along Railroad, Main, Turner and Elliott streets. In addition to this there were about 25 private sewers serving upwards of 80 properties, while the remaining inhabitants depended upon privies and a few cesspools. An 8-inch public sewer in Costello Avenue was being illegally constructed, no application having been made or permit issued therefor.

"Subsequent to the disaster a sanitary survey of the immediate properties in the borough was made by representatives of the Department and the following conditions were found to exist. The public sewer was apparently intact but only 13 properties remained connected thereto. In the territory tributary to the west branch of Freeman's Creek there are 149 estates, 80 of which contribute pollution to the stream, while on Freeman's Creek there are 232 estates, 95 of which pollute the creek. Of the total number, 381 estates, 175 contribute pollution including 79 private sewer connections, 2 cesspools out of a total of 12, 60 privies out of a total of 304 and 13 public sewer connections beside numerous pig pen and barnyard pollutions."

b.—Description of Dam and Cause of Failure.

The District Attorney of Potter County conducted an inquiry into the cause of the failure of the dam. Prof. Frank P. McKibben, the Director of Civil Engineering, Lehigh University, was employed to make a scientific investigation. In December, 1911, before the Engineers' Society of Pennsylvania, he gave a full account of the dam and the disaster and this was published in the Journal of the Society under the title, "The Concrete Dam in Freemans Run, Austin, Pennsylvania." The following is copied from that Journal.

Before being destroyed by flood on September 30, 1911, the town of Austin, Potter County, Pa., had approximately 2,500 inhabitants and was situated in a Y-shaped valley with the majority of the mills and houses in the right fork and in the stem

1. Location and History.

of the Y. A small stream called Freeman's Run traverses the right fork and the stem, thus passing through the town of Austin, and further down the valley, through the village of Costello. The Buffalo and Susquehanna Railroad traversed the West Fork and the stem and had numerous sidings connecting with the various lumber mills in Austin.

About ten years ago the Bayless Pulp and Paper Company of Binghamton, N. Y., impounded a reservoir in Freeman's Run about one and one-half miles above Austin to furnish water for its mill which was located about one-half mile above the town. As demands on this reservoir increased the Company decided to impound a larger quantity of water to serve during low stages of the stream, and Mr. T. Chalkley Hatton was engaged to design and supervise the construction of a concrete dam of sufficient dimensions to form a reservoir of 200,000,000 gallons of water. This dam was begun in May, 1909, and completed about December 1st, 1909, the contract for construction being let to C. J. Britnall and Company, of Binghamton, N. Y., on a percentage plan, and included 15,780 cu. yd. of concrete, 7,921 cu. yd. of excavation in foundations and 6,360 cu. yd. of embankment. The cost, exclusive of engineering, is said to have been $71,821.48. This concrete dam was placed in Freeman's Run about 800 feet below the old dam; nearly three-fourths of a mile above the Bayless Company's Mill and about one and one-fourth mile above Austin. At the site of the dam, the valley is only 350 feet wide with steep slopes rising several hundred feet on either side. The valley is straight and has a drop of 15 or 20 feet between the reservoir site and the town.

2. Details of Construction.

The following description of the construction is taken from "Engineering News," March 17, 1910.

"The entire valley is underlaid with sandstone rock in horizontal layers running from 8 inches to 3 feet thick. Between these layers beds of shale and disintegrated sandstone were located, but there were very few vertical cracks to be observed in the bed of rock. Upon the surface of the rock there was from 5 to 8 feet of earth and compacted gravel deposited from the washings of the side hills. This was so well cemented together that it was removed with the utmost difficulty, and but little water filtered through it into the foundation trench during construction."

"In preparing the foundation all loose rock was removed and the concrete only started after a solid stratum of at least two feet thick was encountered. The surface of the rock was well washed and grouted. A cut-off wall 4 feet thick and 4 feet deep was built and in every case this cut-off wall was carried down to good rock. In order to reinforce the dam twisted steel rods 1¼ inches in diameter and 25 feet long were built into the wall vertically 5 feet inside of the upstream face. Holes were drilled into the foundation rock from 5 to 8 feet deep, and 2.66 feet between centers and the steel rods with expansion bolt heads were placed into these holes, which were then grouted."

"Upon each side of the spillway a pilaster was built which was reinforced by one-half inch steel rods to prevent cracking. The top 12 feet of the dam was reinforced with ½ inch steel rods spaced 2 feet vertically and 4 feet horizontally to prevent cracking. Against the up stream face of the dam an earth embankment was laid at a slope of 3: 1 and reached to within 27 feet of the normal water level at the upstream face of the dam. This embankment was composed of disintegrated shale, clay and some loam free from large stones, and was carefully compacted by grooved rollers in 6 to 8 inch layers, the work being carefully and well done."

"The dam was composed of Cyclopean concrete, with large quarry stones, from ½ to 2 cu. yd. size, embedded firmly in wet concrete. These stones were placed so as to break joints, both as headers and stretchers, and surrounded with not less than 6 inches of concrete, generally with much more. In every case the concrete was built in sections, stepped up, and the steps dove-tailed both horizontally and vertically. In building into the side hills great care was used in getting down to good firm rock foundation before any concrete was laid."

"The material for building the dam was secured from quarries opened at either end of the dam, where duplicate crushers and mixing plants were located. The sand was secured by crushing the sandstone with rolls and screening through sand pans. The composition of the concrete was one part Portland cement, three parts of sand and six parts of broken stone. Each shipment of cement as received was tested upon the works by the resident engineer, who also made numerous tests to ascertain the difference between the tensile strength when using washed bar sand and the sand secured from crushing stone. In every case the mixture containing the sand from the crushed stone gave the greater tensile strength."

"The concrete was handled in two ways. At the two ends it was run down chutes upon the dam, and there shoveled into place. In the middle of the valley the cable way stretched across the valley carried the concrete in buckets to the wall, where it was shoveled into place. In every case it was well turned over and mixed after leaving the mechanical mixer."

The dam was 544 feet long, the maximum section was practically 50 feet in height, 30 feet thick at the base, diminishing to 30 inches at the crest with upstream face vertical and down-stream face inclined.

3. The Preliminary Failure of January, 1910.

In December, 1909, after the dam was completed and before there was any water in the reservoir two vertical cracks appeared, one 51.3 ft. to the west of the spillway and the other 39.5 ft. to the east thereof. These cracks were about one-sixteenth inch wide and extended from the ground to the crest, and were due to contraction. In January, 1910, the reservoir filled so that on January 21, water was flowing over the spillway. On January 22 there was a landslide on the east hill on the downstream side of the dam and water was issuing from under this slide. Furthermore, water passed under the structure and came up through the ground on the downstream side several feet below the dam. The next day a portion of the structure slid down-stream 18 inches at bottom and 31 inches at the top. Cracks opened varying from 4 inches to 2½ inches. The reservoir was then emptied and the water pressure on the up stream face was thus released by removing, with dynamite, an upper portion of the dam at the west end, a large V-shaped section nearly 15 feet deep just east of the spillway, and also a wooden cap from the down-stream end of the cleanout pipe. After the reservoir was emptied it was seen that the rolled embankment which had originally been placed against the up-stream face, had been washed out for a distance of about 100 feet on each side of the intake chamber and that each side wall of this chamber had a crack about 18 inches wide. These side walls of the chamber were perpendicular to the dam's up-stream face so that a motion of 18 inches at the bottom of the dam caused a corresponding crack of 18 inches in the walls and a portion of each wall remained attached to and moved with the dam when it slid.

4. Cause of Failure in 1910.

According to "Engineering News" of March 17, 1910, excavations made above the dam showed that the rock foundation together with the dam had slid forward "due to water getting under the foundation, softening up of stratum of clay or shale lying between two layers of rock and permitting one layer of rock to slip forward about 18 inches upon the lower layer." After the structure had moved and cracked as above described, nothing was done to strengthen it but water was again allowed to collect behind it so that in March, 1910, there was a depth of 36 feet of water in the reservoir and later in the same month the water rose to within 2 feet of the overflow and two streams were passing under the dam, appearing about ten feet below the toe, and another stream was passing around the east end of the dam. Evidently then, the clean out pipe was closed so that the reservoir had considerable water in it two months after the first failure.

5. Proposed Strengthening After the Failure of 1910.

The owners had Mr. Hatton prepare a plan for strengthening the dam and although this was submitted to the owners in February, 1910, no work was done at the dam to carry out the recommendations so that when the dam failed on September 30th, 1911, and destroyed approximately 77 lives and devastated the villages of Austin and Costello, it was practically in the same condition as when the breaches were patched and the reservoir allowed to fill after its first or preliminary failure in the early part of 1910. Mr. Hatton's plan for strengthening the structure involved the construction of a cut-off wall of masonry or puddle to be placed above the dam and extending to the depth of "impervious strata" and at a sufficient distance from the up stream face to avoid injury to the dam by blasting. The plan also provided for re-inforcing the dam against further movements by placing a large quantity of rock filling against its down-stream face in accordance with the plan submitted by Mr. E. Wegmann to Mr. Hatton.

6. The Demolition of the Dam on September 30, 1911.

Eye-witnesses have testified that on the afternoon of September 30, 1911, water was flowing over the spillway and the dam was leaking badly in several places on its down-stream face when suddenly at 2.20 P. M. a portion of the structure at the bottom near the west end burst forward and was immediately followed by a complete demolition of the structure proceeding in sequence from the west to the east end. Several clocks found in Austin after the flood subsided show that the wave struck the town at 2.31 P. M. or about 11 minutes after the dam burst.

7. Conditions of the Structure After the Demolition of 1911.

The writer examined the wrecked structure on October 2 and 3, 1911, and again quite carefully on October 31 and December 1, 1911, and as a study of the fragments yields valuable information and throws much light on the cause of the failure, a detailed description of the broken dam will be here given. Of the original length of the dam about one-fourth or 129 feet remains practically intact, the balance of 415 feet having been broken up and moved down-stream. A short piece at the east end remains practically intact as did also a piece at the west end. Between these two end pieces there are seven large fragments, and although there are many smaller pieces of the dam lying as far as several hundred feet down stream. It is with the nine major pieces that most interest centers. As one examines the structure he is impressed with the fact that four of the largest sections moved, simply slid down-stream remaining nearly vertical and are now standing from 5 to 50 feet below, and rotated from the original alignment of the structure. The other three sections were moved down stream and overturned. The earth fill has been washed out immediately behind the dam but a considerable area of this fill together with its slope-paving remains in place, thus leaving a rather steep bank on the side of the fill towards the up-stream face of the dam. As the water rushed through the openings between the broken sections, it washed out a large basin at the west end, below and around a big fragment and a smaller one. The stream now passes through the earth-fill at the sluice-way walls which remain nearly intact, thence around the east end of a large fragment and through the east of the gap. Water stands in the basins below and around the fragments so that, of the footing course, only the upper part is visible on a few of the pieces.

Except for a few small cracks, section A is intact in its original position and is 19 feet long on the crest. At its westerly end its maximum thickness is about 4 feet. The east bank almost entirely covered this fragment but erosion has exposed it to view.

Section B, 39 feet long on the crest remains upright but has rotated through an angle of about 10 degrees and because of rotation and its sloping east face, the east end of the crest has moved up stream 3 feet while its west end has moved down-stream 6 feet. The upper part of the footing course is exposed and shows that the dam and footing are not separated but have moved together, the plane on which sliding occurred being below water level, either at the junction of the concrete footing with the rock stratum or else between two strata underlying the concrete. At the westerly end this section is 18 feet 9 inches thick at a depth of 38 feet below the crest, continuing with this thickness to the base which is 49 feet 6 inches below the crest. A greater part of this piece was embedded in the hillside, and through the wisdom of reducing the thickness of the base of a 50 foot dam from 30 feet in the valley to 18 feet 9 inches in the bank may be seriously questioned, nevertheless this reduced thickness has absolutely no bearing on the failure of the Austin dam.

Section C about 75 feet long on the crest and 90 feet at the base broke squarely through the dam from crest to bottom, except that the west upper corner is broken off. This broken corner corresponds in size and position to a portion of the gap that was made east of the spillway in 1910 by blasting and which was later filled with a V shaped mass of concrete. Section C has moved about 50 feet down-stream, rotated through an angle of 60 degrees and remains standing on its base in practically an upright position though its top is slightly tilted up-stream and the crest is about 5 feet below its original level. Here is perfect evidence of sliding, but whether rupture took place on a hortizontal plane in the concrete footing, or on one between the concrete and rock bottom or on a plane between two rock strata, can be determined only by pumping and excavating. The only rods visible in this fragment are small form rods projecting from the east ruptured surface. A part of the footing course is visible above water.

Section D, which lies about 100 feet down-stream, is the lower portion of the dam and came from the gap between C and E, the upper part being washed away. Section D corresponds to the short piece east of the spillway between the two old cracks and is without doubt the part of the original section which was under the portion blasted out east of the spillway, and the depth of the notch made by blasting corresponds very closely to the depth of the part that is missing. This section D lies on its west fractured plane with a large part of its base exposed above water and with its original up-stream face vertical and making an angle of about 45 degrees with the dam. Its average length is about 16 feet, thus corresponding with the 16-foot section between old cracks. The fact that this fragment came from under the blasted portion, with which it must have had a very poor bond, and from between the two cracks, together with the fact that it is so far removed down-stream and the fragments B, C, E and F are all turned toward it, points very strongly to this as one of the first pieces to give way. It should be remembered, too, that this Section D was at or near the point of maximum movement of 1910. Hence, many things point to first failure having occurred at section D by sliding, and if the eye-witnesses to the failure are correct when they testify, as they have, that the first break occurred near the west end, it must be said that since there are also good reasons why failure should occur at the west end and that as the time interval between the collapse of the two portions under consideration must have been very small, it is either impossible to tell which gave way first or else the witnesses could not clearly record the proper sequence of events which must have transpired so quickly. It makes little practical difference which section moved first since both were unsafe and there were ample reasons why both should fail. There is no visible shearing or splitting of any of the sections near the east end as are so evident at the west end. The base of this small section D is quite smooth and is covered over about one-half its exposed area with a very thin layer of rotten shale varying in thickness from ¼ inch to 1½ inches and adhering to the concrete. Here is absolute proof that this section was placed on quite a large area of thin stratified rock of a rotten texture. This section clearly slid on its base on a horizontal plane at junction of concrete and the thin shale. Parallel scratches in this shale indicate sliding. There are six 1¼ inch twisted rods projecting from the bottom of fragment D, five of which are broken by tension, the sixth having pulled out of the foundation and all are bent. There is excellent evidence that no cut-off wall existed on this section.

Section E contains the spillway; is about 115 feet long on the crest and has slid down-stream 36 feet at its east and 20 feet at the other. Its thickness at base measures 30 feet. It stands practically upright except that its east end is about 4 feet below its original elevation while the west end is within one foot of that level. The upper east corner is broken off as if along the junction with the blasted section east of the spillway. This fragment E is the largest of all the pieces and that it has slid on or in the rock strata, and not at the top of the footing, is clear because a considerable portion of the footing is visible on the up-stream side. A large vertical crack in the east end of the spillway section nearly divides this fragment into two pieces. Except for a large smooth vertical area on the west ruptured surface of this section caused by wooden forms in construction there is nothing further about this piece that calls for comment.

Section F is also a large fragment having a length on top of about 90 feet and on the bottom of about 70 feet standing slightly tilted up-stream with its east end 25 feet and its west end 20 feet down stream. The crest at the west end is several feet below its original level and at the east end it has sunk only a small amount. There is nothing of special note about this section more than to state that it has slid on or in the rock strata and that its west ruptured section instead of being a fairly complete transverse plane is ragged, with the crest overhanging the lower part of the fracture. A part of the footing is visible above water.

Section G varies from 26 feet long at its upper edge to 47 feet long at the bottom and lies on its up stream face, below the dam with its base down-stream. The upper part of this section for a depth of 6 feet 6 inches below the crest has separated on a large smooth plane and has been washed down stream, a part now lying under fragment H. What is of greater importance is that the footing course has parted from the main portion of the dam and lies a few feet from it. The bottom of the main portion and the top of the footing, which were originally horizontal, are very smooth, showing clearly that this large area was a horizontal joint through the dam at junction of main section and footing, the visible part of which averages 15 feet wide by 31 feet long. From the position of the footing it is apparent that this section G slid out at the bottom on a plane between the concrete and rock, and being somewhat held at the crest was turned over so that its crest fell up-stream, the footing separating from the main section during this movement. As previously mentioned eye-witnesses have testified that the first break occurred at the bottom near the western end and if they are correct this is undoubtedly the piece that first gave way. The dam slid upon the rock at this point. No reinforcing bars whatever show either on the base of the main portion or in the footing as far as these are visible, but nine 1¼ inch twisted rods are projecting from the long pointed part of fragment J on which fragment G originally stood. Of these nine rods, five show tension breaks with a reduction of area of 50 per cent. while the other four rods are bent down-stream but are unbroken.

Section H has moved 110 feet down stream. and is lying on its up-stream face with the crest pointing towards the west. It is 34 feet long on the crest and is the upper 34 feet of the main section of the dam. Except for one projection mentioned below this fragment had a fairly smooth base, thus showing the presence of a horizontal construction joint. In other words this section slid off at a horizontal joint 34 feet below the crest and was originally between G and J and resting on a flat portion of J which is still in place. This was the only place in the entire structure where concrete slid on concrete. and with the exception of section G is the only piece in which there is an important separation of concrete on a horizontal plane. On October 29, 1911, this fragment H broke in two from cantilever action on a horizontal construction joint 17 feet below the crest showing a smooth surface 9 feet 9 inches by 29 feet. On the night of October 31st a large slab 15 feet by 8 feet by 3 feet 6 inches thick which had been projecting from base of Section H fell off thus leaving the base of H a fairly smooth, badly discolored surface about 21 feet by 20 feet.

Section J is intact and for a distance of 110 feet along the crest is in good condition. At its easterly end there is a step 34 feet high and at the bottom of this step the concrete has a horizontal surface, trapezoidal in plan, 21 feet long and varying in width from 10 feet to 15 feet. This is a construction joint of nearly 260 square feet and is for the most part quite smooth. It has six 1¼ inch square twisted rods projecting 3 feet from it but these rods are all bent down-stream. It is from this horizontal plane that fragment H came. To the east of this place, section J is spalled badly, finally terminating in a long point as described above under the head of Section G.

The concrete is for the most part very good, except for the horizontal joints near the west end already discussed and for large flat pieces of stratified stone so embedded in the concrete in positions to cause horizontal planes of weakness. Large areas of these horizontal joints are covered with laitance. An experimental determination gives the actual weight of concrete as 152 lb. per cu. ft. There are very few reinforcing rods visible at the fractures. All fractured vertical surfaces except that between Sections A and B, and that between H and J are discolored by long contact with water, thus showing that the dam broke into fragments at the old cracks.

On each side of the basin washed out by water flowing between sections E and F there is a remarkably interesting illustration of the effect of the horizontal pressure due to the motion of these two heavy masses of concrete. As E and F slid downstream the thin strata of sandstone and shale were folded upward at the toe of the structure to a height of 10 feet, and the water cutting through this fold left a perfect section of the folded strata exposed to view.

8. The Cause of the Failure.

The dam failed by sliding, first at fragment G where all concrete slipped on the underlying strata and probably immediately thereafter at the horizontal construction joint under fragment H; and then fragments F, E, D, C and B slid forward on the underlying strata. The resultant pressures were inclined from the vertical at angles having tangents from 0.82 to 0.87, being a maximum at or near the base. And here lies the cause of the collapse. When water penetrated the joints and the foundations, the dam required a co efficient of friction more than 0.87 to prevent slipping while the material on which it was placed could offer a co-efficient of possibly not over 0.50 and probably not over 0.33. The co-efficient of friction of concrete on concrete is probably not over 0.66.

9. Summary of Main Facts.

The failure of this dam is due to sliding as a result of faulty foundation, faulty design, faulty construction and faulty operation.

The material upon which the dam was placed consists of thin layers of shale and sandstone. In at least one place covering an approximate area of 100 sq. ft. this shale is very poor, where a layer varying in thickness from ¼ inch to 1½ inches adheres to the up-turned bottom of the dam, showing clearly many scratches due to the sliding of the dam. On other parts of this bottom the concrete is exposed with none of the thin layers of shale attached to it. This shale is so soft and can offer so little resistance to sliding that the dam slid upon it.

Calculation on and an examination of the wrecked structure show the design of the dam to be faulty in that the base was practically level, was not stepped, and was not carried deep enough to resist sliding, and that proper provisions were not taken to prevent the percolation of water under the dam. The structure shows that in its design no allowance was made for upward water pressure in the joints or under the base and hence the thickness of the dam was entirely too small. In view of the character of the foundation, this is a serious mistake.

Faulty construction in the dam is shown in several places, especially near the western end where large, fairly smooth joints passed horizontally through the structure. These places of weakness should not have been allowed to exist and are due to the improper method of laying the concrete in large horizontal layers, and allowing one layer to harden before the next was placed upon it. On many of these horizontal construction joints laitance formed and was not removed, thus making the joint less capable of resisting sliding, because of the smoothness and weakness of this laitance. One section of the dam at the west end slid on one of these horizontal construction joints within the concrete at an elevation of 34 feet below the top of the dam. Furthermore, the large stones placed in the concrete were of such poor material and were so placed in nearly horizontal layers, as to weaken the structure's resistance against sliding. The operation of the structure, i. e., its use after completion, was faulty in that after the dam had once failed by sliding, in January, 1910, water should not, under any circumstances, have been allowed to collect in the reservoir behind the dam until the latter had been put in a safe condition.

10. Lessons Emphasized by This Failure.

1. A thorough knowledge of the underlying materials is necessary before a dam can be properly designed or built.

2. No dam should be placed on poor materials consisting of disintegrated or stratified rock without taking proper precautions to prevent water from getting under the base or between the underlying strata, and if such prevention be impossible, and the dam must be built in such a location, then it must be designed with full upward pressure and with large factors of safety against overturning and sliding.

3. Greater emphasis must be laid on sliding as a possible method of failure and proper precautions must be taken to prevent destruction in this manner. Factors of safety against sliding are frequently taken too small.

4. It is desirable to secure more accurate information concerning the co efficients of friction of various materials and the effect thereon due to wetting of these materials.

5. Upward pressure due to intrusive water should always be assumed in design and in extreme cases should be taken larger than is now customary; say equal to the full hydrostatic pressure over the entire area of the base in cases of poor foundation. While this is no doubt unusual it is necessary, especially since practically all dams leak to a greater or less extent and since only a factor of safety of two against overturning, and one scarcely as large against sliding, are frequently used even when no upward water pressure is considered. For over-flow dams the vacuum effect must be allowed for, unless eliminated and in design of dams for use in cold climates ice pressure must be considered.

6. Greater care should be taken to avoid large horizontal construction joints as well as large vertical planes of weakness so arranged as to reduce their shear carrying power. In this connection it must be realized that in Cyclopean masonry the use of large stratified rocks or of any large rocks so placed as to produce horizontal planes of weakness should be carefully avoided. Before depositing concrete on a hardened concrete surface all laitance must be removed and the joint properly prepared. It is important to have competent state supervision of all dams, reservoirs, and bridges, which, while not relieving the owners from their responsibility, will provide an additional safeguard to life and property.

C.—Comments on the Failure, by the Engineer Who Built the Dam.

A large proporton of the engineering profession seem to have entertained the idea that the construction of the dam was seriously defective and that its failure was what would naturally be expected. The engineer who designed and constructed the dam, however, has shown that he took conscientious care in planning the structure and in building it. The owner, although attempting to influence the engineer to keep the expenditures down to the lowest possible limit, depended upon the engineer's judgment entirely as to the safety of the dam, and so far as learned, there has been no attempt on the part of the engineer to shirk the responsibility for the design. He introduced provisions for strengthening the structure which the clients thought were needless. Holes were drilled before laying the foundation to test the underlying strata, and in judging of the suitability of this foundation the engineer has said that subsequent events proved his judgment to have been poor but at the time he sincerely believed that the foundations were secure. He has said that he did not sufficiently protest against the paring down of the work by the clients. Furthermore, he has made a plea for governmental supervision of the design, construction and operation of dams. The plans for the Austin structure were not submitted to or approved by any State official.

B.—LANCASTER WATER WORKS.

A special investigation of the Lancaster water works system was made by the Chief Engineer in person during April of 1911. A Lancaster newspaper made charges against city officials relative to alleged mismanagement of the operation of the water-works system and calling for an investigation by the Commissioner of Health. In the following pages a full report of this water works system, the conditions under which the filtration plant was built, the efficiency of the filters in reducing typhoid fever, the installation of the germicidal plant, and the conditions and stipulations of the decree of the Commissioner of Health based on the investigations made by the Chief Engineer requiring certain extensive improvements to the water works system, is given in detail arranged according to schedule below:

1. PRIOR DECREES.
    a—General Conditions.
    b—Sewerage Decrees.

2. PRIVATE WELL and WATER SUPPLIES and TYPHOID in 1909.
3. SOURCE OF CITY WATER SUPPLY.
4. WATER WORKS SYSTEM.
5. FILTER PLANT.
    a—The Lancaster Water Filtration Company.
    b—Preliminary Treatment of Raw Water.
    c—Final Treatment.
    d—Filtered Water Reservoir.

6. STATE TESTS OF WATER.
7. CHLORINATED LIME TREATMENT.
8. THE FILTER PLANT AS A PUBLIC HEALTH SAFEGUARD.
9. PROPOSED CITY IMPROVEMENTS TO THE WATER WORKS SYSTEM.
10. CONCLUSIONS.
11. THE DECREE OF THE COMMISSIONER OF HEATH.

1. Prior Decrees.

a—General Conditions.

Lancaster City is a community of about 50,000 people located on the main line of the Pennsylvania Railroad and on the west bank of the Conestoga Creek about thirteen miles above the point where the stream empties into the Susquehanna River. The region round about is the richest country in the United States in value of agricultural products produced annually. In consequence of the fertility of the soil, the rural districts are well built up. Lancaster City is the trading place for a total population of possibly one hundred and fifty thousand persons. In eighteen hundred and ninety, its population was thirty-two thousand and eleven; ten years later, it was forty-one thousand four hundred and fifty-nine; and in nineteen hundred and ten, the population was forty-seven thousand two hundred and twenty-seven, within the limits of the city. There are many flourishing and some extensive industrial plants in the town and altogether the prospect of future growth warrants the laying out of public improvements along comprehensive lines in contemplation of a large ultimate population.

Lancaster owns its water works system, taking the supply from the Conestoga Creek at a point in Manheim Township just above where the railroad bridge spans the stream. The city also discharges its sewage into the creek at several points below the water works intake. The first sewer is the Clay and Lemon Street district trunk main, a circular structure ten feet in diameter draining a total area of one thousand three hundred and sixteen acres upon which there is an approximate resident population of twelve thousand persons which sewer outlet discharges into Conestoga Creek at a point twelve hundred feet down stream from the intake of the city water works, and slightly more than one quarter of a mile above Rancks mill dam owned by the city and leased as a mill privilege. This dam forms a pool, and backs the water up about four feet deep in the sewer, and up stream beyond the water works intake.

The drainage area of Conestoga Creek above the pumping station is about three hundred and ten square miles. The minimum yield available for flow from this area at the pumping station, during a long dry period, is approximately eight million gallons in twenty-four hours or twelve and a half cubic feet a second, or four hundredths cubic feet a second to the square mile of watershed. This result is not surprising and compares with the known yield of other streams draining similar country. This flow is the measure of water that Lancaster can depend upon from the creek in periods of drought, unless storage be resorted to. The maximum daily consumption is in excess of the minimum flow of the creek. If the consumption increases in the city, a serious shortage of water will occur whenever there is a severe drought unless storage be provided. Thus it may be seen that during a dry time when the flow of the creek is insufficient to feed the city pumps, the deficiency would be made up from out of the pool formed by Rancks dam this causing an upstream current that would take the flow of the sewer and supply it to the unsuspecting public in Lancaster for drinking purposes. At ordinary water stages it is not probable that any sewage from the city sewer reaches the water works intake, but in times of extreme drought, when the consumption of water approaches in volume the volume of flow of the creek, the danger from sewage contamination is very great. Something should be done to prevent the contamination of the city water supply by city sewage. A new dam should be constructed across the creek just below the water works intake. Thus any possibility of an upstream flow of sewage would be prevented. This dam should be provided with flash boards and Rancks mill dam water level should be maintained at a lower elevation than the height of the proposed intake dam during dry times.

b-Sewerage Decrees.

On May seventeenth, nineteen hundred and six, the Commissioner of Health issued a decree relative to sewerage in which it was stipulated that a dam should be built across Conestoga Creek. Said decree was as follows:

"It has been unanimously agreed that the interests of public health require that your attention be called to the insecurity of the city's use of Conestoga Creek as a sewer, and further, it is only a question of a short time at the most, before the city will be forced to purify its sewage before discharging the liquid into the creek; therefore, the most prudent and economical policy for the city to pursue is to adopt a separate system of sewerage.

"With this end in view, I hereby grant permission to the city of Lancaster to arch Gas Run as proposed and to use the same as a sewer for the discharge of sewage into Conestoga Creek until first day of May, one thousand nine hundred and seven, on the following conditoins:

"FIRST: That on or before said date, May first, one thousand nine hundred and seven, the city shall submit a plan of a separate system of sewerage, so called, comprising a system of sewers into which the discharge of roof or surface water shall be excluded, and whose object shall be to provide for the collection of all of the city and its speedy removal to one or more common point or points where the sewage shall be treated according to plan to be prepared by the city and submitted for approval to the Commissioner of Health when called for by him.

"SECOND: That on May first, one thousand nine hundred and seven, provided the city of Lancaster has complied with the above condition, the Commissioner of Health may extend the time and fix the date of said extension, wherein the city of Lancaster may discharge sewage from its sewers into Conestoga Creek, provided still further, THAT THE CITY OF LANCASTER SHALL HAVE CONSTRUCTED ON OR BEFORE SAID DATE, A DAM ACROSS THE CONESTOGA CREEK AT A POINT NEAR AND JUST BELOW THE PRESENT CITY WATER WORKS INTAKE ACCORDING TO PLANS DRAWN BY F. H. SHAW AND ON FILE IN THE OFFICE OF THE COMMISSIONER OF HEALTH; OR IN SUBSTANTIAL ACCORDANCE THEREWITH. WHEREBY MEANS WILL BE AFFORDED FOR PREVENTING SEWAGE FROM

ANY OF THE CITY SEWERS OR FROM THE PUMPING STATION, DWELLINGS IN THE VICINITY AND WASH WATER FROM THE FILTER PLANT FROM REACHING THE SAID INTAKE."

In the fall of nineteen hundred and seven, the city submitted for approval plans for a sanitary sewer system for that portion of its territory in the Clay and Lemon Street district and on December fifth, nineteen hundred and seven, the Commissioner of Health issued a decree in which the dam was prominently mentioned. The conclusions of this decree were as follows:

"Since the permit of May seventeenth, nineteen hundred and six, bids were asked and received by the city for the said dam at the pumping plant. The figures ran so high, however, that it was considered expedient to defer construction in the hope that the Clay and Lemon Street outlet sewer could be extended down stream below Rancks mill dam for a less expenditure, and thus obviate the necessity of the new dam. The interests of the public health in this case, are and should be considered by the local authorities to be paramount to other considerations. A dam without a highway bridge and piers should be built for about twelve thousand dollars. Such a sum would be totally insufficient to intercept the sewage from the Clay Street district and the Lemon Street district and from the filter and pumping plant, including storm water, and convey it below Rancks dam.

"In view of these conditions, it has been further unanimously agreed by the Governor, Attorney General and Commissioner of Health that the interests of the public health demand that approval be given, and I do hereby and herein give approval, for the plans of the proposed sanitary sewer system for the Clay Street drainage district, and grant permission for the discharge of the sewage therefrom into Conestoga Creek at the Clay and Lemon Street district, under the following conditions and stipulations:

"FIRST: This permit to discharge sewage into the Conestoga Creek shall cease on the first day of January nineteen hundred and ten, and provided the other terms of the permit shall have been complied with on said date, the Commissioner of Health may extend the time in which sewage may continue to be discharged from the proposed sewers into the waters of the State. But if, on or before January first, ninteen hundred and nine, the city of Lancaster has not erected, or taken active steps to erect a dam across the creek immedately below the water works intake, in accordance with plans to be prepared and submitted to the Commissioner of Health for approval as a part of the completion of the sewerage improvements, as fully hereinbefore outlined, then on January first, nineteen hundred and nine, the discharge of sewage into the waters of the State from the sewers herein approved shall be without State sanction and render the city liable to the penalty prescribed by law for discharge of sewage without a permit."

The city on March thirteenth, nineteen hundred and eight, submitted for approval plans for a sanitary sewerage system for the entire municipal territory. The dam was again made the subject of a special stipulation in the decree which was issued on June eleventh, nineteen hundred and eight, as follows:

"In view of the foregoing considerations, it has been unanimously agreed by the Governor, Attorney General and Commissioner of Health that the interests of the public health will be subserved by approval of the proposed plans, and I do hereby and herein approve the same and issue a permit therefor, under the following conditions and stipulations:

"FIRST: This permit to discharge sewage into the waters of the State from the Lemon Street sewerage district and from other districts hereinbefore mentioned, excepting the Clay Street drainage district previously provided for in the permit of December fifth, nineteen hundred and seven, shall cease on the first day of July, nineteen hundred and eleven, and provided the other terms of this permit shall have been complied with on said July first, nineteen hundred and eleven, the Commissioner may extend the time in which sewage may continue to be discharged from the proposed sewers into the waters of the State. BUT IF ON OR BEFORE JANUARY FIRST, NINETEEN HUNDRED AND NINE, THE CITY OF LANCASTER HAS NOT ERECTED, OR TAKEN ACTIVE STEPS TO ERECT, A DAM ACROSS THE CREEK, IMMEDIATELY BELOW THE WATER WORKS INTAKE, IN ACCORDANCE WITH PLANS TO BE PREPARED AND SUBMITTED TO THE COMMISSIONER OF HEALTH FOR APPROVAL AS A PART OF THE COMPLETION OF THE SEWERAGE IMPROVEMENTS, THEN ON JANUARY FIRST, NINETEEN HUNDRED AND NINE, THE DISCHARGE OF SEWAGE INTO THE WATERS OF THE STATE FROM THE SEWERS HEREIN APPROVED SHALL BE WITHOUT STATE SANCTION AND SHALL RENDER THE CITY LIABLE TO THE PENALTY PRESCRIBED BY LAW FOR DISCHARGE OF SEWAGE WITHHOUT A PERMIT.

"SECOND: On or before July first, nineteen hundred and eleven, the city shall prepare detail plans for the erection of a definite site or sites of works for the treatment of all of the city sewage, both domestic and manufactural and shall submit such plans to the Commissioner of Health for approval."

On the seventeenth day of August nineteen hundred and nine, the city made an application for approval of plans for the dam to be located immediately below the intake at the water works pumping station, but no money was provided and construction work was not begun.

On August sixteenth, nineteen hundred and ten, the city asked permission to temporarily discharge certain sanitary sewers into convenient storm drains. The local authorities were notified that the State Department of Health would not approve the discharge of sewage into Conestoga Creek and that the sewage now going into the stream was being discharged without State sanction. The serious menace to public health consequent upon the continued emptying of sewage into the pool out of which water for drinking purposes was taken by the water works system was again emphasized, but it was stipulated that since withholdment of the right to build the sewers asked for would seriously handicap the development of property, if the city would give some assurrance in written form to the Commissioner of Health that current reports to the effect that money has been appropriated for the dam and that it will be built immediately, the Commissioner of Health might grant the petitioner's request. This brought forth in response the following communication from the Mayor. At that time it was not known to the Department that one of the first official acts of his Honor, the Mayor, upon assuming office in the spring of ninteen hundred and ten was to send a forceful communication to build the dam and that upon the insistence of the Mayor, councils finally passed the ordinance:

"Lancaster, Pa., November 22nd, 1910.

"Hon. Samuel G. Dixon,
"Harrisburg, Pa.

"My dear Doctor: I understand that an application for a permit to connect a sanitary sewer in the city of Lancaster is being held up until some assurance can be given that the money has been appropriated for the erection of a dam in the Conestoga Creek near the water works.

"I am very happy to inform you that city councils have passed an ordinance authorizing a bond issue to cover this work and that the reason why it has not been engaged in at this time is because the engineers advised delay until next spring because of cold weather interfering with concrete construction.

"Very truly yours,
"FRANK B. McCLAIN,
"Mayor."

The detail plans for this construction work were submitted to the Department for approval on the fifth day of April, nineteen hundred and eleven.

2. Private Well and Water Supplies and Typhoid in 1909.

In the year nineteen hundred and eight, it was estimated that twenty-five thousand persons resided in houses connected to the sewer system and that ninety per cent. of the population live in dwellings located on the lines of existing sewers, so that over fifteen thousand persons dispose of sewage otherwise than into the drains. There are six thousand and twenty privies in use on properties, many of which have sewer connections. Cesspools are common. They are of the loosely walled kind. The census taken by the water department showed six hundred and thirty-nine cesspools in use and three hundred and thirty-two wells used as sources of drinking water. In the sewerage decree of June eleventh, nineteen hundred and eight, the following mention was made of the domestic well supply:

"In connection with the domestic well supply whose maintenance is always suspicious in a built-up community, particular examintaion of the waters is advised and prompt condemnation if the tests prove contaminated. Compulsory sewer connections are a partial remedy only."

In the summer of nineteen hundred and nine, there was an outbreak of typhoid fever in Lancaster. Speaking of this, the Board of Health in its report for the year nineteen hundred and nine, has gone on record as follows:

"It is a cause for thankfulness that this acknowledged healthy city has been free from any thing of a prevalent epidemic disease, if we be allowed to except the months of June and July, when more than the ordinary prevalence of typhoid fever existed. This, fortunately, was all traced, more or less, to the wells from which water was taken for drinking, and at once, by this board, dismantled and discontinued in their use; in several instances having introduced the use of city waters."

The medical inspector's report to the local board of health was as follows:

"In addition to the facts set forth in the statistical report prepared by the Secretary of the Board, it is perhaps fitting, that a few additional facts should be presented, concerning the epidemic of typhoid fever during the summer months of the year nineteen hundred and nine.

"The total cases reported for the various months follow:

"May, four; June, fifty-six; July, twenty-three; August, twenty-five; September, twelve; October, eleven; November, six.

"Such a number of typhoid fever cases would naturally be a serious problem and be a source of great anxiety and at once question the purity of the water supply of the city, were it not for the fact that the great proportion of these cases occurred in the eastern section of the city, and among users not of city water, but of water drawn from wells; and especially from a running spring situated on Ann Street below Chestnut. Many of the cases, occurring in remote sections of the city, were among teamsters and others in the habit of drinking from this spring going to and from their daily work.

"As the Secretary states, this spring was closed, city water substituted and many wells in the neighborhood after chemical analysis showed them unfit for use, were closed by the Health officer.

"Another striking fact in this epidemic, was the extreme mildness of the disease, in cases traced to this source, there being practically no mortality; the febrile course very naturally raises the question as to the true identity of the disease. It could have been paratyphoid; but whatever the disease, the evidence seems clear as to its being a water-borne infection of some nature.

"At the close of the epidemic, in the eastern section of the city, numerous scattered cases of the disease occurred for which, after careful inspection, chemical analysis of the tap water in the houses and work upon the milk served at the houses infected, the Health Officers are at a loss in offering any explanation for the source of infection.

"Besides the epidemic of typhoid or paratyphoid fever, very little occurred of special sanitary importance during the year covered by the report."

On June twenty-third, nineteen hundred and nine, Dr. J. L. Mowry, County Medical Inspector of Lancaster County for the State Department of Health, requested assistance from the State Department of Health in investigating what was reported to be a typhoid fever outbreak in a settlement in the eastern part of Lancaster City and in the adjoining townships of Manheim and Lancaster. The cases investigated by the Department differ in number from these finally reported by the local board of health. The explanation may be due to diagnosis, the type of the fever being unusual. According to the State's information there were during nineteen hundred and nine, one hundred and fifty four cases of so-called typhoid fever within the city of Lancaster, and six cases in Manheim Township in that part of it immediately adjoining Lancaster, and two cases in the neighborhood of Lancaster Township. These cases were distributed by months as follows:

January,	0
February,	2
March,	0
April,	1
May,	4
June,	73
July,	20
August,	21
September,	17
October,	12
November,	5
December,	7

The number of cases within the city for the first five months of the year was normal. There were 7 cases for this period in the above report. Two of these were brought from the country for treatment in the city, and two others were traced to the country. In July and August, the number of cases increased largely, the greatest number occurring in June and a few during September and October. The latter cases were attributed to bathing in the polluted waters of Conestoga Creek. All of the cases during June, July, August, September and October were of a very mild form. Many of the patients were up and about in a short time and but two of the cases were fatal. In the early part of the outbreak, the physicians were requested by the local board of health to report all suspicious cases to the Board of Health and mark them as suspicious. It is thought that many of the cases reported were suspicious only but were not so designated in the reports. The county medical inspector was of the opinion that a great majority of the so-called typhoid fever cases were not true typhoid but were due to some water borne infection giving many of the symptoms of typical typhoid fever. Sixty-four per cent. of the patients were males and sixty per cent. of the males were between five and nineteen years of age. It is thought that the large per centage of cases among the males of the ages of under twenty years is explained by the fact that it was the custom of most of these individuals to frequently bathe in the polluted waters of the Conestoga Creek. The males were also more generally upon the street and partook of the infected waters at the "running pump" and other public wells that were later condemned because proven to have caused at least sixty-four cases of fever. During the month of June and until the middle of July, the great majority of the cases were among the males. During the latter part of July in August and September the majority of the cases were among females. It is probable that the distribution of the cases in this manner was due to the fact that many of those occurring among the females in the latter part of the summer were of secondary infection in the households where patients had been cared for.

In searching for the cause of the outbreak the milk supply was soon relieved of suspicion.

The public supply of the city was under the constant supervision of the city chemist. At no time did he find any contamination in the public water. During the latter part of April the water filtration plant had been thoroughly investigated by an officer of the State Department of Health and a number of samples were gathered for analyses. Additional samples were collected at the filtration plant by the Department during June and July and these samples also showed that the filter plant was doing efficient service.

The city chemist for the local Board of Health sampled every individual water supply at the property upon which a typhoid case appeared. Of the numerous analyses made, twenty-nine wells and springs were found to be polluted and were condemned.

The largest number of cases was attributed to the "Running Pump," the water of which was available on the street for public use. It was thought that at least 44 cases were due alone to the use of this polluted water. Fourteen cases were attributed to the use of this and other condemned wells. Six cases were attributed to other condemned wells alone in the neighborhood of the "Running Pump." Nine cases were attributed to the well at the Cork Works. Thus at least seventy-three of the so-called typhoid fever cases were thought to have been caused by the use of polluted water supplies of individual ownership. By the activity of the local board of health, those wells most in use and liable to be sought by the public were permanently closed.

During the course of the investigation a number of cases located in distant parts of the city were traced directly to the well water in this district. Drivers of delivery wagons and others drank from the running pump as it was the only open public supply in the eastern part of the city available for watering and drinking purposes.

3. Source of City and Water Supply.

The drainage area of Conestoga Creek above the water works intake comprises three hundred and ten square miles on which there are located seven boroughs with a combined population of eight thousand seven hundred and sixty-six persons; twenty-two townships with a combined population of twenty-eight thousand nine hundred and fifty-six, or a total resident population of thirty-seven thousand seven hundred and twenty-two persons. Two of the tributaries rise in the South Mountains in Lebanon County and two other main tributaries begin in Berks County where the geological formation is red shale and sand stone. The branch which begins near Cornwall, Lebanon County, has its origin in several large springs in limestone formation from which the waters gush with a more constant flow. About half of the area of the watershed is of the geological formation mentioned and the remainder is limestone. Naturally the quantity of the waters which soak into the ground and are subsequently yielded as flow of the creek contain in solution those properties which render waters "hard." Also during rain storm of intensity when the ground is not frozen, the shales, sands and clays are washed with the torrents into the streams and are brought down with muddy sediment by the water works intake. Excepting the hilly sections in the vicinity of the Lebanon and Berks County line, having five townships in Berks County, with a population of one thousand three hundred and seventy-three on the watershed, and of three townships in Lebanon County with a population of one thousand seven hundred and ninety-four on the watershed, the watershed is rolling farmland with a dense population amounting to one hundred and twenty-two per square mile. This is remarkable. There are on the area supplying water to the city of Lancaster no part of which area is more than twenty-five miles distant, and the more important part is within fifteen miles of the intake, three thousand four hundred and ninety-five farms on which fifteen thousand eight hundred and thirteen cattle are pastured, eleven thousand nine hundred and twenty-two horses and sixteen thousand and thirty-five pigs are kept. There are five thousand two hundred and thirty residences, one hundred and fifty-seven schools, one hundred and thirty-seven churches, seventy-two hotels, two hundred and ten stores, one hundred and ninety-three factories, twenty-three creameries,, seventy-four grist mills and four hundred and twenty miscellaneous properties or a total of ten thousand one hundred and eleven properties.

The disposal of wastes from a country inhabited by so large a population is bound to affect the quality of the water in the streams draining such areas. While large amounts of sewage have not been discharged into the creek at any one point on the watershed, the quantity of waste matter of animal origin that pollutes the waters from the entire watershed has been great in the aggregate. Sewage pollutions of small streams by rural population are irregular but none the less dangerous. Occasionally they give rise to widespread epidemics in the town supplied by the surface water receiving the pollution. The conditions upon the Conestoga Creek watershed are in every way favorable for the transmission of infection by water.

The treatment of a public water supply may not necessarily remove all sewage from it. A breakdown or dropping off in efficiency of the filter or apparatus may admit polluted water into the piping system of the city and hence into the homes of the consumers. The safeguarding of the public health in Lancaster demands that the poisons of human origin shall be kept out of the Conestoga Creek in the first place. The State Department of Health, therefore, has made a sanitary survey of the entire watershed, has visited every occupied estate, gathering the statistics hereinbefore given, and finding three hundred and forty-two properties on which there existed direct sewage pollution of running waters and has abated most of these menaces. Six cases of stream pollution are now in the hands of the Department's attorneys for prosecution.

In times of storm for short periods except in the winter the waters of the creek become very muddy. Generally the water is quite clear and rather hard because of the linestone formation. The amount of mud carried by the creek during short intervals is as great or greater than that carried by the Allegheny River at Pittsburgh.

In the following table are given data concerning the hardness and sediment represented by turbidity and the chemical and bacterial quality of the creek waters at the pumping station intake, the results of careful and systematic analyses by the city chemist.

Raw Water

DATE.	Parts per Million Hardness.		Turbidity, Silica Standard.	Bacteria per c. c.	
	Total.	Alkalinity.		Total.	B. Coli.
1910.					
August 2,	146	138	20	14,000	present
August 12,	120	112	100	9,500	present
August 16,	128	122	40	5,600	present
August 26,	136	126	40	4,100	present
August 31,	140	130	30	2,700	present
September 6,	142	134	24	1,900	present
September 13,	148	138	30	1,800	present
September 21,	142	130	20	1,700	present
September 28,	140	130	30	2,000	present
October 5,	142	132	20	1,100	present
October 11,	136	130	24	1,500	present
October 19,	140	130	24	2,000	present
October 27,	136	128	24	1,800	absent
November 2,	140	132	30	2,700	present
November 10,	144	134	24	20,000	present
November 14,	142	134	24	2,600	present
November 22,	138	128	20	1,100	absent
November 28,	144	132	24	4,400	absent
December 8,	140	130	16	4,000	present
December 15,	142	130	20	17,000	present
December 20,	144	132	40	21,000	present
December 28,	142	132	24	82,000	present
1911.					
January 3,	138	128	350	165,000	present
January 12,	140	128	30	13,000	present
January 17,	136	122	40	12,000	present
January 24,	146	134	36	13,000	present
February 24,	140	128	30	7,000	present
March 1,	144	132	24	5,000	absent
March 10,	138	128	16	4,000	absent
March 15,	144	132	10	16,000	present
March 22,	142	132	12	17,000	present

Raw Water. Parts Per Million.

DATE.	Nitrogen.				Chlorine.	Total Solids.
	Free Am.	Alb. Am.	Nitrites.	Nitrates.		
1910.						
August 2,	0.027	0.105	0.005	1.2	2.3	170
August 12,	.035	.120	.008	1.4	2.3	178
August 16,	.032	.110	.006	1.2	2.3	170
August 26,	.027	.095	.005	1.1	2.3	168
August 31,	.025	.090	.005	1.3	2.3	164
September 6,	.025	.087	.005	1.25	2.3	170
September 13,	.018	.080	.004	1.4	2.3	168
September 21,	.018	.085	.004	1.4	2.3	170
September 28,	.020	.080	.004	1.2	2.3	162
October 5,	.015	.077	.004	1.0	2.3	170
October 11,	.015	.070	.003	1.2	2.3	148
October 19,	.018	.080	.003	1.4	2.3	154
October 27,	.018	.070	.004	1.4	2.3	164
November 2,	.022	.090	.004	1.8	2.3	176
November 10,	.022	.095	.004	1.8	2.3	170
November 14,	.024	.096	.005	1.6	2.3	168
November 22,	.022	.095	.004	1.8	2.3	170
November 28,	.018	.090	.004	1.2	2.3	164
December 8,	.015	.080	.004	1.4	4.0	170
December 13,	.018	.070	.004	1.6	5.0	170
December 20,	.022	.094	.004	2.0	5.0	170
December 28,	.020	.088	.004	2.0	5.0	178
1911.						
January 3,	.022	.095	.004	2.2	4.0	282
January 12,	.022	.095	.004	2.4	4.0	176
January 17,	.015	.080	.004	2.0	4.0	170
January 24,	.022	.088	.004	2.2	4.0	178
February 24,	022	.090	.004	1.8	3.5	168
March 1,	015	.075	.003	1.2	4.0	168
March 10,	.015	.078	.004	1.2	3.5	172
March 15,	.016	1.080	.004	1.2	4.0	176
March 22,	.022	.082	.004	1.0	4.0	176

It will be seen from these tables that the raw water, the source of supply to Lancaster, contains evidence of sewage pollution almost constantly. This is to be expected from so thickly populated a watershed. No system of patrol or regulation of sewage disposal could render the waters of the Conestoga pure and wholesome at all times.

4. Water Works System.

Beginning with the Century the subject of public improvement in Lancaster was agitated. Better sewage disposal methods in the town, improvements to the water works and the purification of the water supply were discussed. Moneys were raised with which to defray the cost of building sewers and making changes in the water works system. The local authorities deemed it inexpedient to place upon general taxation the cost of installing a water purification plant. The proprietors of a patented method of water treatment proposed to build a plant and deliver filtered water to the city and such an arrangment was entered into.

In the early part of ninteen hundred and six, improvements to the water works system were completed by the city comprising a twelve million gallon high duty pumping engine, a thirty inch cast iron force main from the pumps to the stand pipe, a steel standpipe, twenty-five feet in diameter and one hundred and ten feet high, capacity four hundred and four thousand gallons, intended for use in the high service district, and a sixteen inch low service cast iron main from the low service reservoir to the district served by it.

At the present time the city system comprises a pumping plant, two force mains, a low service distributing reservoir and district, and a high service standpipe and district.

Fifty years or more ago the city installed at a point on the creek 2.62 miles below the present pumping station the original water works dam and fire house. It was abandoned in 1888 when the present pumping station was erected. In this station there are duplicate raw water steam turbine centrifugal pumps, each of 10,000,000 gallons capacity for 24 hours. They deliver the water of the creek through a 30-inch force main to the filter plant.

In the station there are also three town service pumping engines, one a 6,000,000 gallon capacity pump installed in 1888, one a 10,000,000 gallon pump installed in 1893, and one a 12,000,000 gallon pump installed in 1903, each of the horizontal compound duplex type. They receive filtered water only through a 30-inch gravity main from the filter plant, and deliver it into the town by a system of piping that admits of any pump being put upon the high or low service. Pumping is a continuous operation at the station.

Ranks dam maintains a water level in the creek opposite the station of 247.3 feet (U. S. Datum). From this pool raw water is admitted into a 9-foot masonry conduit protected at the mouth by gratings to keep out ice and larger floating objects. This chamber extends into the engine room where the bottom of the chamber or pump well is 8.7 feet below the normal level of the pool and 18.8 feet below the level of the floor of the station. The highest flood recorded was 8 inches depth of water on this floor, the ground being the same level outside, and near the wall outside of the building there is an open gate chamber provided with screens and sluice gates which are always kept closed and tight to prevent the flow of creek water into the pump well in the station. But there are numerous leaks in the walls of the old pump well so that the water level therein is substantially that of the water level in the creek. It is clear and ground filtered and is used for feed water in the boilers. Into this pump well there has been laid a 36-inch cast iron pipe connected up to the suction ends of the three town service pumps and also connected to the 30-inch filtered water main from the filter plant. Thus it is used as a suction chamber. However, on its end nearest the creek there is a check valve which admits, in case of any accident and shutting off of filtered water, the drawing of raw creek water to supply the town pumps. In such event the sluices gates in the outside chamber would be opened.

Off of the raw water conduit near the creek bank has been constructed a new screen chamber and leading therefrom there are two lines of 30-inch pipe terminating in the pump well at the centrifugal pumps. It is small and was built and the steam turbines installed when the filter plant was constructed. No record is kept of the pumpage of the raw water. As much is supplied as the filters require from hour to hour; but the water delivered from the filters to the town pumps is very carefully measured by a Venturi meter just where it enters the pumping station. In the following table is given the monthly consumption in million gallons of filtered water pumped into the distributing system:

Monthly Consumption in Million Gallons Filtered Water Pumped Into Distributing System.

MONTH.	Year.					
	1906	1907	1908	1909	1910	1911
January,	....	179.3	188.3	189.9	171.3	202.8
February,	....	173.5	191.3	168.4	191.8	180.2
March,	....	191.5	195.7	185.7	205.1	....
April,	71.7	175.2	190.6	182.5	200.5	....
May,	191.5	178.9	208.9	204.2	209.3	....
June,	198.8	189.4	220.5	210.0	214.9	....
July,	195.0	202.1	231.4	234.9	244.5	....
August,	190.0	209.2	226.7	230.4	238.2	....
September,	194.5	208.4	213.0	213.8	227.6	....
October,	184.9	212.9	222.8	214.1	230.8	....
November,	173.5	196.0	209.2	177.2	201.8	....
December,	177.5	196.1	201.9	180.2	211.7	....
Total,	1577.4	2312.5	2500.3	2391.3	2547.5	383.0
Average daily,	6.11	6.34	6.85	6.40	6.95	6.5

In the northeastern section of Lancaster, on high ground, about eight-tenths of a mile from the pumping station, the city owns a block of land lying between East King Street and Orange Street upon which is located the distributing reservoir and the standpipe.

The reservoir is an earth embankment structure with sloping sides lined with brick and the bottom also. It is divided by an embankment into two unequal basins. The west basin is 125 feet square on the bottom and 195 feet square at the top. The easterly basin is 125 feet wide by 225 feet long on the bottom and 195 feet wide by 285 feet long on the top. There is an 8-inch pipe connecting the two basins. On the top of the embankment which is three feet higher than the water level there is a walk and iron fence.

The basins are kept usually full of water. The height does not vary over 3 feet. There is a poor circulation, especially in the east basin. At times algae are noticeable. The area of the water surface is 1.74 acres and the depth of water available for consumption 13.32 feet. The total capacity of both basins used as one reservoir is five and one half million gallons. In the following table are given the capacities in gallons for each foot in height. At high water the elevation of the flow line is 417.32 feet (U. S. Datum) or 156.32 feet higher than the center of the pump cylinders at the Conestoga Creek station:

Reservoir Capacity.

Depth of Water in Feet.	Capacity in Gallons.
13.32, High water,	5,583,513
12,	5,397,240
11,	4,835,940
10,	4,294,747
9,	3,775,096
8,	3,176,998
7,	2,800,422
6,	2,344,920
5,	1,908,807
4,	1,492,798
3,	1,094,978
2,	721,461
1,	367,808
0, Low water,	120,844

The water is raised from the pumping station by any of three town service pumping engines, through the 36-inch force main into the west basin, being delivered at the top out of the pipe which rises vertically. Ordinarily the water is distributed from the reservoir into the low service district. There is a 20-inch pipe starting near the bottom of each basin. They join east of the basins and reduce to a 12-inch supply main which feeds the low district in which the maximum pressure is about 35 pounds. In this district, which comprises the low-lying territory along Water street sewer east, are numerous manufactories, but the total mileage is four miles only or about 6.5 per cent. of the distributing pipes in the entire city excluding force mains. There is a low area in the northeastern section that is to be piped and included in the low service. The county farm also is now supplied from the reservoir.

There are 20 inch supply mains from each basin that connect directly to the high service system. Should the standpipe pressure fall off for any reason or the high service be temporarily suspended for any reason, water from either the east or west basin or both could be delivered into the mains of the high district but there would be no adequate pressure.

It is proposed to install an emergency pumping station at the reservoir to raise water from the basins into the standpipe or the pipe system of the high district whenever this may be needed. Thus one day's supply could be made available were the creek source cut off for this or a shorter period.

The high service lines comprise sixty miles of pipe. The water is pumped directly into this system through a 30 inch main which branches into sub-mains near the reservoir, the surplus water being stored in the standpipe which acts as an equalizer. This tank is located immediately east of the reservoir, rests on a concrete base and when full to elevation 508 which is 90.68 feet higher than the full reservoir level it gives a pressure in the center of the city at city hall of about 60 pounds and at Franklin and Marshall College on the highlands of about 25 pounds.

On the same lot there is a sink hole in the limestone. The 8-inch blow-off from the standpipe and 12 inch overflow from the reservoir go to this sink hole. There is also a 20 inch drain pipe from each basin that connects to the old 12 inch force main, now used as a drain with an outlet into the creek at the old city mill.

Water from the high service can be delivered into the low service pipes by connections existing in the vicinity of the reservoir or the pumping station.

5. Filter Plant.

a—The Lancaster Water Filtration Company.

Filtered water is being furnished to the city of Lancaster by the Lancaster Water Filtration Company, the successor to the Pennsylvania Maignen Filtration Company under the following contract:

"This agreement made this 13th day of June, A. D., 1905, between the city of Lancaster of the one part, and the Pennsylvania Maignen Filtration Company, a corporation duly organized, of the second part.

Witnesseth:

"WHEREAS: By an ordinance of the city of Lancaster, entitled,' an ordinance authorizing the execution ot a contract with the Pennsylvania Maignen Filtration Company, a corporation duly organized, for the construction, erection, maintenance and operation by the said Pennsylvania Maignen Filtration Company, or its assigns, of a plant for the filtration and purification of the entire water supply of the city of Lancaster, Pa., and providing for the compensation to be paid by the said city of Lancaster for the filter service, also providing options on the part of the said city of Lancaster to purchase the said filter at certain fixed prices, and at certain stated periods, duly approved the 19th day of August, A. D., 1904, it was provided, that this contract should be executed.

"Now, Therefore: For and in consideration of the mutual covenants and agreements herein contained, it is mutually covenanted and agreed by and between the parties hereto, respectively as follows:

"Clause No. 1. The said Pennsylvania Maignen Filtration Company, the party of the second part, hereby agrees to filter the entire water supply of the city of Lancaster, and to that end and for that purpose agrees to erect and construct at its own cost, on suitable ground provided by the said city, and approved by the said party of the second part, a filter plant with all appurtenances, as shown and described in accompanying plans and specifications of sufficient size and capacity for the filtration and purification of the said entire water supply of the said city of Lancaster, and the said Pennsylvania Maignen Filtration Company, party of the second part, further agrees to maintain and operate the said plant for a period of thirty-five years from the day of the starting of the plant; and the said party of the second part further agrees that the said plant shall be erected according to the designs, general drawings and specifications hereto attached, with such improvements as the parties hereto may mutually agree upon, and be maintained in such a way as to give the results guaranteed. In case of any defect or deficiency in said plans, specifications or said system, the said company shall alone be liable. The said party of the second part further agrees that it will, within three months from the date of this contract, unless prevented by litigation, begin construction of said plant, and have the same completed so that it may be ready for use within three hundred and fifty suitable working days after beginning work; and the said party of the second part further agrees that it will properly maintain and operate such plan at its own charge and expense and will deliver the filtered water into the intake of the pumping station of the said city, and agrees that all water delivered to the city shall be filtered to the following standards, to wit: the turbidity in the water after treatment, during each fiscal year, as gauged by the silica standard shall not average in excess of five parts in one million for eighty per cent. of the time, ten parts in one million for ten per cent. of the time, and fifteen parts in one million for ten per cent. of the time. The annual average of the samples shall not contain more than one hundred and twenty-five bacteria per cubic centimeter, and when the river water contains more than four thousand and two hundred bacteria per cubic centimeter, the average bacterial purification shall not be less than 97 per cent. The samples will be taken once daily or once weekly, during such periods as may be mutually agreed upon between the water committee of councils and the party of the second part, by a bacteriologist mutually agreed upon by the said parties hereto, and in case of disagreement, the bacteriologist shall be selected by the State Board of Health and approved by the parties hereto. The said bacteriologist shall make the turbidity tests, and for his services each of the parties hereto shall pay one half. Should coagulation be deemed necessary by the party of the second part, in order to deliver water of the standard required (at times of freshets or at other unusual times), no chemical or chemical compound shall be used as coagulants in the process of filtration, except such coagulants are recognized by filtration experts as practical for the purpose to be accomplished. Should at any time the filtered water be found to be below the standard above specified, notice shall be given immediately by the bacteriologist to both parties and in the event of his services being dispensed with, then said notice shall be served by the chairman of the water committee upon both parties, who shall then and there agree on the extent of the failure and register the same; and in case of neglect or refusal on the part of the party of the second part to restore the water supply to the quality required by these specifications, after notice has been served on them by the water committee of council that the water is not of the quality as herein specified, then the city may refuse to make any payment whatsoever for water delivered by said company after said notice, until the water shall be restored to contract standard, and as a penalty no payment shall be made by the party of the first part for any water delivered during the period of such defective quality as above mentioned, counted from the date of said notice to the days of the restoration of the supply to the contract standard. It is agreed that both parties shall abide by the data obtained by the bacteriologist, as to the quality of the water and the period of time it may be defective, and should either party become dissatisfied with the work of said bacteriologist, he shall be replaced by another, recommended by the State Board of Health, and approved by both parties. If after one year's operation the plant has shown itself capable of living up bacteriologically to the guarantees given, the services of the bacteriologist may be dispensed with, in the event of a dispute or difference thereafter, between the said parties hereto, as to the quality of the filtered water and the period of time the same may be defective, the decision thereof shall be referred to the State Board of Health, and its decision shall be conclusive and binding on both parties.

"The said party of the second part further agrees that the filtration plant shall be erected, constructed and finished within three hundred and fifty suitable working days after the work shall have been begun unless prevented by litigation, strikes, public calamity, or act of God, and shall be of sufficient capacity to filter the water as above at the rate of not more than nine million gallons of water per twenty-four hours. And the said party of the second part further agrees that at the expiration of five years from the date that the party of the second part shall have notified the party of the first part of its readiness to deliver filtered water under the terms of this contract, the said city of Lancaster shall have the right and option to purchase the said filtration plant for the sum of two hundred and twenty-five thousand ($225,000) dollars, if it shall have given to the party of the second part six months' notice of its intention so to do prior to the expiration of the said five years, and provided also the money therefor, has been lawfully appropriated and provided before the giving of such notice; and if the said party of the first part does not exercise the said option to purchase at the expiration of five years, then the said party of the first part shall have a right and option to purchase the said filtration plant at the expiration of ten years for the sum of one hundred and ninety thousand ($190,000) dollars, if it shall have given to the party of the second part a like six months' notice of its intention so to do prior to the expiration of the said ten years and provided also that the money therefor has been lawfully appropriated and provided before the giving of such notice; if the said party of the first part does not exercise the said option to purchase at the expiration of ten years, then the said party of the first part shall have the right and option to purchase the said filtration plant at the expiration of fifteen years for the sum of one hundred and seventy thousand ($170,000) dollars, if it shall have given to the party of the second part a like six months' notice of its intention so to do, prior to the expiration of the said fifteen years, and provided also that the money therefor has been lawfully appropriated and provided before the giving of such notice; and if the said party of the first part does not exercise the option to purchase at the expiration of fifteen years, then the said party of the first part shall have the right and option to purchase the said filtration plant at the expiration of twenty years for the sum of one hundred and fifty thousand ($150,000) dollars, if it shall have given to the party of the second part a like six months' notice of its intention so to do, prior to the expiration of the said twenty years, and provided also that the money therefor has been lawfully appropriated and provided before the giving of such notice; and if the said party of the first part does not exercise the said option to purchase at the expiration of twenty years, then the said party of the first part shall have the right and option to purchase the said filtration plant at the expiration of twenty-five years for the sum of one hundred and thirty thousand ($130,000) dollars, if it shall have given to the party of the second part a like six month's notice of its intention so to do prior to the expiration of the said twenty-five years, and provided also that the money therefor has been lawfully appropriated and provided before giving of such notice; and if said party of the first part does not exercise the said option to purchase at the expiration of twenty-five years, then the said party of the first part shall have the right and option to purchase the said filtration plant at the expiration of thirty years for the sum of one hundred thousand ($100,000) dollars, if it shall have given to the party of the second part a like six months' notice of its intention so to do, prior to the expiration of the said thirty years, and provided also that the money therefor has been lawfully appropriated and provided before the giving of such notice, and if the said party of the first part does not exercise the said option to purchase at the expiration of thirty years, the said city shall at the expiration of thirty-five years from the date of the giving of the notice of the readiness of the party of the second part to deliver filtered water as aforesaid, and in consideration of the yearly rentals paid by it to the party of the second part during the said period, become the absolute owner of the original plant erected under this contract without further cause.

"Clause 2: The said city of Lancaster, party of the first part, hereby agrees to provide and set apart to the party of the second part the necessary land for the said filtration plant which shall be suitable for the said purpose, and approved by the party of the second part; and the said party of the first part further agrees that it will and shall provide the labor and power necessary to deliver the river water to the filter plant for filtration, and the water for the maintenance and operation of the filter plant, and shall also furnish such exhaust steam as the city may have to spare to heat the buildings of the filter plant, if necessary and required by the party of the second part.

"Should any filtered water be required for washing or other purposes by the party of the second part, after it has passed through the pumps of the city, the quantity thus furnished shall be deducted from the total amount delivered to the party of the first part each month, and filtered water used by the city for boilers or otherwise before it has passed through the pumps of the city, shall be paid for by the city.

"The party of the first part agrees to pay to the party of the second part, or its assigns, in such amounts and to such persons as the party of the second part, or its assigns, shall direct, the sum of one and one-half cents for each one thousand gallons of water filtered by the party of the second part, and the amount of water filtered shall be ascertained either from the records of the pumping station of the city of Lancaster, which shall receive the water filtered, or the party of the second part shall have the right to measure the same by meter or otherwise in a manner mutually agreed upon by the parties hereunto.

"If the party of the first part, upon receiving notification from the party of the second part that the filter plant is ready to receive water for filtration, shall fail to deliver such water, the party of the second part shall be entitled to receive payment for the minimum amount of water herein specified, namely five milliom gallons in twenty-four hours, although no water should be filtered on such days as the city fails to deliver same.

"If on any one day the city fails to deliver to or accept from the party of the second part at least five million gallons in twenty-four hours, the party of the second part shall be entitled to payment as if five million gallons were actually delivered to the city.

"If the filter plant delivered more than five million gallons on any one day of twenty-four hours, the party of the first part will pay to the party of the second part for all the water that shall be filtered and delivered to the party of the first part, at the rate of one and one-half cents per thousand gallons.

"It is agreed that in crediting the party of the second part for water filtered, each day of twenty-four hours beginning at noon, shall be considered as a unit and water filtered during any one such unit has no relation to and is not to be averaged with the amount of water filtered during any other such unit.

"Payment shall be made by the party of the first part to the party of the second part monthly, for each calendar month, on the tenth day of the month following that during which the service shall have been rendered or the amount accrued.

"No deduction shall be made in the payment accruing the party of the second part, under the terms of this contract, until the end of each fiscal year, during which this contract shall run, when differences and deductions (if any) shall be adjusted.

"The party of the first part agrees, at the time of execution of this contract, to make and execute a lease to the party of the second part, for the life of this contract, for the piece or pieces of ground set apart for the plant, and the city councils shall authorize, empower and direct the proper officials to execute and deliver such lease or leases.

"The party of the first part hereby covenants and agrees to provide the moneys payable under the terms of this contract, and to make available, from time to time, the payments falling due for filter service under the terms of this contract, when and as the same shall respectively become due and payable under the terms hereof.

"Clause 3. Whenever under the conditions of this contract action on the part of the city of Lancaster, shall be necessary in order to carry out the provisions and meaning thereof, the select and common councils of the said city shall have exclusive power and authority to act, except where authority has been specifically designated in said contract

"Clause 4. Should the plant erected by the party of the second part prove unequal to the task of filtering water up to nine million gallons on any one day of twenty-four hours, the party of the second part is to increase the area of filtering surface at (its own cost) to bring said plant up to the above capacity, without any compensation from the party of the first part, and if after six months' notice given by the water committee of councils, establishing said deficiency, the party of the second part has not provided the necessary additions, said party of the second part shall pay a penalty at the rate of three cents per one thousand gallons for every one thousand gallons short of the guaranteed quantity.

"Clause 5. It is hereby further agreed that the said party of the second part shall give to the said city of Lancaster (party of the first part) a bond of indemnity, with good and sufficient security, in the sum of ten thousand ($10,000) dollars, for the faithful performance of the conditions of this contract, for one year after the completion of the plant.

"Clause 6. In the event of any question, difference or dispute between the parties hereto, relative to or rising out of this contract, and which cannot be settled between the parties, the same shall be referred to three competent arbitrators, one to be selected by each of the said parties hereto, and the third to be selected by the two first chosen; and it is agreed that the decision of the arbitrators shall be final and conclusive upon the parties hereto.

"IN WITNESS WHEREOF: The corporate seal of the city of Lancaster, party of the first part hereto hath been affixed, duly attested by the mayor of the said city, and the hand and seal of the said party of the second part hereto hath been affixed, the day and year first above written, and that upon the execution and delivery thereof by the said respective parties, the same shall be binding upon the city of Lancaster."

In 1891 an engineer was employed to devise plans for waterworks improvements and he recommended as one of the changes, the installation of a filter plant at the pumping station. In 1896, in another report, some system of filtration was recommended as essential. In 1899, plans for a system of slow sand filtration were submitted by an expert employed for the purpose. Various plans had been recommended, but owing to an apparent lack of confidence by the people in the recommendations of the different engineers caused partly through the failure of the West End reservoir and partly through suspicion borne of political prejudices, such as is not uncommon in cities, no active steps were taken by the city until it received the proposition of the filtration company.

Under the contract the city purchased a 30 acre tract of land opposite the pumping station on the east bank of the creek adjoining the railroad and here construction work was begun in August 1905, and filtered water was first delivered to the city on April 2, 1906, payment for the same commencing on April 18th.

The system consists of a preliminary treatment of the raw waters and final treatment by filtration.

In the preliminary treatment sedimentation with or without coagulation depending upon the condition of the raw water, is used, and straining through rough filters also.

The final treatment comprises upward filtration through preliminary filters of coke and sponge, and secondary filtration downward through sand.

b—Preliminary Treatment of Raw Water.

The raw water centrifugal pumps hereinbefore described are connected with a 30 inch force main laid in the rock bottom of the creek and surrounded by concrete and terminating at the coagulating tanks. In the same trench is the 30 inch return filtered water main and also a 6-inch pressure pipe connected to the town force main.

The chemical house is a wooden structure resting upon a reinforced concrete tank 44 feet long, 24 feet wide and 10 feet deep, interior dimensions. There is a wooden floor over this tank supporting the chemical hoppers and machinery used in mixing the chemical solution. There is a two story wing on the ground floor of which there is an office and a work room. The second story is used in which to store the chemicals. The bottom of the concrete tank is elevation 276.5 or 29.2 feet above the crest of Rancks dam. One branch of the 30 inch rising main from the turbine pumps enters this tank at the bottom at the sides nearest the creek by means of a quarter bend and is extended up above the top of the tank and the wooden floor, ending in a quarter bend at an elevation of 290.3 feet. Thus when water is forced through this pipe and bend, which is always the case when coagulants are used the vertical lift is 42.4 feet. At the bottom of the tank is a 24 inch branch from the 30 inch main with valve through which the water is discharged when coagulation is not deemed necessary. The average height of the water in the tank is 285, hence the average lift of water from the creek is 37.7 feet.

Another branch of the 30 inch rising main extends directly to the filter building so that raw water can be by-passed around the preliminary treatment apparatus and be delivered directly to the filters.

Inside of the main tank are built 8 circular or mixing tanks 7.5 feet in diameter and 10 feet deep. They are arranged in pairs, two pairs on each side of the force main. The four tanks next to the wall are fitted with coagulating devices. Over each supported from the floor is a vertical can 18 inches in diameter and 30 inches high into which the dry chemicals are shoveled. Into each of these hoppers an agitator shaft is fitted with arms for pulverizing the chemicals and mixing them. From thence they are emptied through a slot in the bottom at the side fitted with a gate to regulate the quantity of coagulant.

Each of the eight coagulating tanks is fitted with an agitating device operated by an undershot water wheel actuated by the water discharged through the quarter bend at the top of the 30 inch main. This water after passing through the wheel is led by flumes to the coagulating tank. The machine used for mixing the chemicals in the hopper is located on the floor over the main tank and is operated by a water motor.

Each coagulating tank has an opening in the bottom 18 inches square connecting it with its corresponding tank. The latter have six 12 inch holes in the sides farthest from the primary circular tank, six feet above the bottom, through which the coagulated water passes into the main tank. There are also gates in each circular tank to admit of drainage into the main tank. This main tank is connected to the main drainage gullet outside extending to the creek. The sediment is flushed ont by fire hose under city pressure.

One hopper and its corresponding primary and secondary coagulating tanks only are used unless the raw creek water is particularly turbid and then a second hopper and tandem tanks are used. Most of the time when coagulation is in progress six circular tanks are out of commission and four tanks always stand full of water with no current in them. It is reported that these four tanks have been used. They are held in reserve. When coagulation is not necessary the 24 inch valve at the bottom of the tank is opened and the water passes directly into the main tank.

Obviously the capacity for sedimentation in this main tank is the space left outside of the eight circular tanks it contains, and at the average height of water level, this capacity is approximately 40,000 gallons. During periods of greatest consumption in the city the rate is about 8,000,000 gallons in 24 hours. If raw water were delivered to the chemical house at this rate, it would displace this capacity in the main tank in about 8 minutes; but there are currents and hence much of it passes through in a shorter time. Only the heavier sediment would deposit at such velocity.

The coagulant used is in the form of powder and is a mixture of sulphate of alumina and 58 per cent. soda ash. The proportions of the chemicals and the amount of mixture used are varied according to the conditions of the raw water and are determined by the superintendent who depends upon his judgment as to the amount necessary to precipitate the mud. At present slightly less soda is used than alum.

From the main tank the water passes out of the bottom through a 30 inch main up into the bottom at the centre of a circular reinforced concrete setting basin open on top having a diameter of 49 feet and a depth of ten feet interior dimensions. The floor of this basin is level with the floor of the main tank. Water is admitted to a circular compartment about 6.5 feet in diameter, the walls of which are carried up ten feet high. In these walls seven feet above the floor there are 16 eight-inch openings out of which the water flows into the next compartment whose wall, 10 feet high, is about 6.58 feet distant from the central compartment and in which wall at the bottom there are 16 six-inch by twelve-inch openings out of which water flows into the next compartment whose walls are also ten feet high and 6.58 feet distant and contain 16 openings ranging in diameter between 6 and 9 inches, the tops being 6.5 feet above the floor. The smaller openings are located in the sides of the wall nearest the outlet pipe from the outer compartment, the larger openings being on the opposite side. The water flows out of these openings into the outer compartment whose width is 6.58 feet. On an average the water in this settling basin is 18 inches below the top of the walls at which level the capacity of the several compartments is substantially as follows:

Inner compartment,	2,100 gallons.
Next compartment,	18,600 gallons.
Next compartment,	38,200 gallons.
Outer compartment,	50,600 gallons.
Total basin,	109,500 gallons.

At the bottom of this primary settling basin in the outer compartment there is a 30-inch pipe outlet which passes down and thence horizontally underground to the adjacent secondary settling basin of the same form of construction elevation and dimension, but having one circular baffle wall only, making an interior tank 24 feet in diameter, walls ten feet high. The water enters the centre of this compartment and passes out through the baffle wall by means of 16 rectangular openings ranging in size from 6 inches by 12 inches to 9 inches by 12 inches, the larger ones being placed on the side farthest from the outlet pipe which is located near the outer edge of the outer compartment. The bottom of these openings are one foot above the floor of the tank. The inner compartment has a capacity to the average water line of about 28,800 gallons and the outer compartment 82,900 gallons, making a total capacity for this scondary basin of 111,700 gallons.

Primary settling basin capacity,	109,500
Secondary settling basin capacity,	111,700
Total settling capacity,	221,200 gallons.

When raw water is being supplied at the rate of 6,000,000 gallons per 24 hours, the 109,500 gallon capacity in the primary settling basin would be displaced theoretically in 26 minutes and the 111,700 gallons capacity of the secondary basin in 27 minutes only but undoubtedly there are currents that permit some of the water to pass through in much less time. When the raw water is being supplied at the rate of 8,000,000 gallons, it can pass through both settling basins in 40 minutes or less. These short periods are totally inadequate to effect proper sedimentation even if coagulants are used as is evidenced by the fact that comparatively little sediment is collected in these basins.

Facilities are afforded for draining the sediment from each settling basin into the main drainage gullet of the plant.

From the bottom of the secondary settling basin the water passes down and through a 30 inch pipe up into the next two tanks of the same dimensions and elevation. These tanks are the straining basins and they contain no baffle walls, the water entering at the center of each, the two acting together as one unit. They originally contained concrete distributing conduits radiating from the centre which were covered with 9 inches of 4 -inch stone, 17 inches of coke and 3 inches of sponge held down by wire netting and sponge; but becoming easily clogged, causing much expense for cleaning, this arrrangement was abandoned, the material removed except the distributing conduits, and wooden racks were built about 30 inches above the floor. They consist of 2-inch by 2.5 inch yellow pine, spaced three quarter inches apart, covered with 9 inches of coke and 3 inches of sponge held down by wire netting covered with stone. The outlet of each of these straining tanks is a 24-inch pipe in the side wall five feet above the floor and on the side nearest the filter plant. These outlets are connected with the 30-inch supply main to the filter house.

At the ordinary water level, the capacity of each tank above the surface of the strainer is 66,700 gallons. This volume is displaced theoretically in 32 minutes when the water is being admitted at the rate of 3,000,000 gallons in 24 hours, or in 24 minutes when the rate of flow is 4,000,000 gallons. In other words, it takes from 60 to 90 minutes for the raw water to pass through the preliminary treatment apparatus.

Located between the circular tanks and the filter building is a concrete drain discharging by means of a 24-inch vitrified pipe into the creek just above the railroad bridge. In the pipes connecting the coagulating tank at the chemical house and the circular tank are inserted branches between each tank that discharges into the drain through 16 inch pipes controlled by valves located in said gullet and operated from the surface of the ground outside the building. These pipes are used for emptying and cleaning the tanks which often contain two feet in depth of coagulated mud after a period of roily water. They are emptied and cleaned as occasion demands. A fire hose stream under city pressure is used in the process. It is reported that 804 cubic yards of mud was removed from these tanks and the influent gullet in the filter house after nine days of very turbid water in July of 1907.

The preliminary treatment should do the greater part of the water purification work especially with the turbid creek supply. The filter plant could not be operated satisfactorily unless coagulants were used. Sulphate of alumina is the only coagulant used on a large scale throughout the country. Surface waters usually contain carbonates of lime and magnesia held in solution and called alkalinity. The sulphates combine with the lime and magnesia and remain in solution, and aluminum carbonate is formed and quickly changes to aluminum hydrate, a white, sticky, flaky substance which envelopes or covers each particle of clay or suspended matter with a sticky outer coat. These particles then collect together, gradually rolling up into flakes or balls through adhesive attraction. Enough alum must be used to completely coat all of the particles, otherwise they will not unite and produce proper coagulation. There is an approximate relation between the turbidity of the raw water and the necessary amount of coagulant to throw down the suspended matters. The coarser suspended matter will take less coagulant than the finer suspended matter consisting principally of minute clay particles. Occasionally when a water contains a high amount of fine clay, this clay may absorb four grains of aluminum sulphate to the gallon which is thereby not available for coagulation. Such a condition requires sufficient alum to effect coagulation in addition to the amount of alum absorbed.

It is sometimes necessary when the alkalinity of the raw water falls below the requisite amount required to produce the aluminum hydrate to add lime or soda ash to make up the deficit. Generally one grain of alum to the gallon decomposes about eight parts in the million of alkalinity, but it is safe to estimate on ten parts alkilinity to one grain of alum applied.

The attendant in charge of the filter plant determines on the amount of alum and soda ash to be used by inspection, using a glass for test. He puts in enough chemicals to produce small coagulant flakes and produce quick action in clearing up the glass full of water and based on these tests he determines the proportion of chemicals to be used with the varying conditions of the raw waters. It will be noted by reference to a preceding table that the alkalinity averages about one hundred and thirty parts to the million which according to the above rule should be capable of decomposing 13 grains of alum for each gallon of raw water treated.

Experience over a wide range of country and different waters has proven it desirable to have at least four hours of quiescent subsidence of water to which coagulants have been added to secure the best results of this preliminary treatment prior to filtration. It has been shown that in the plant under discussion one and a half hours or less is the maximum and that throwing out of consideration the straining tank, the period for coagulation is less than one hour. In consequence it has been found necessary by operators, to add to the already sufficiently alkaline raw water, large quantities of soda ash to effect the reactions before the waters reach the filters. This is a waste of money as will be shown later. In the following table is given a record of the chemical coagulant used in the preliminary treatment of the raw water since the installation of the treatment plant. It gives the days and the hours when chemicals were used, the pounds of coagulant thus used, the gallons of water treated during these times and the grains of alum and soda applied to each gallon.

Record of Chemical Coagulants Used in Preliminary Treatment of Raw Water.

Date.	Days—Whole or part.	Hours—Absolute.	Coagulants used lbs.		Million gal. filtered.	Grs. per gal.	
			Alum	Soda		Alum	Soda
1906:							
Aug. 4 to 6,	3	56	7,155	6,692	14.87	3.36	3.15
Sept. 13 to 17,	5	110	11,905	13,891	27.43	3.04	3.54
Sept. 22 to 25,	4	79	5,550	6,664	20.96	1.85	2.22
Oct. 5 to 9,	5	108	13,320	16,868	26.83	3.47	4.47
Dec. 18 to 20,	3	58	5,130	5,708	14.04	2.55	2.70
Totals and averages,	20	411	43,060	49,823	104.13	2.90	3.35
1907:							
Dec. 31 to Jan. 3,	4	78	10,360	12,447	17.79	4.07	4.89
Jan. 5 to 7,	3	51	4,810	6,424	11.98	2.81	3.85
Jan. 12 to 16,	5	96	12,580	15,052	19.92	4.42	5.28
Jan. 21 to 22,	2	29	2,230	3,066	7.09	2.20	3.03
Mar. 2 to 4,	3	36	6,660	7,967	12.47	3.74	4.47
Mar. 9 to 12,	4	60	7,770	9,685	17.49	3.11	3.88
Mar. 13 to 17,	5	96	23,680	6,079	24.65	6.72	1.72
Mar. 20 to 22,	3	54	4,440	6,025	14.00	2.22	3.01
June 2 to 4,	3	47	4,810	5,702	10.20	3.30	3.91
June 21 to 22,	2	31	5,180	5,709	8.78	4.12	4.55
June 30,	1	7	1,110	1,244	1.42	5.47	6.13
July 7 to 15,	9	202	28,490	30,261	53.48	3.72	3.94
July 18 to 22,	5	93	14,060	15,433	28.42	3.46	3.80
Aug. 9 to 12,	4	60	5,920	7,058	15.79	2.62	3.12
Sept. 11 to 13,	3	54.30	2,960	3,787	9.08	2.28	2.91
Sept. 23 to 26,	4	53.00	8,510	10,921	15.57	3.83	4.91
Sept. 30 to Oct. 1,	2	30.00	4,440	5,290	8.88	3.49	4.17
Oct. 8 to 10,	3	54.00	8,140	9,015	11.12	5.12	5.67
Nov. 2 to 6,	5	92.00	14,630	15,584	25.17	4.06	4.33
Nov. 24 to 26,	3	40.00	4,810	4,731	11.22	3.00	2.95
Dec. 10 to 12,	3	48.00	7,400	7,820	12.70	4.08	4.31
Totals and averages,	74	1,311.30	182,990	189,300	337.22	3.80	3.93
1908:							
Jan. 12 to 14,	3	54.30	8,510	9,341	14.01	4.25	4.66
Feb. 14 to 17,	4	63.00	13,690	15,054	17.23	5.56	6.11
Feb. 26 to 28,	3	42.00	12,580	14,259	11.31	7.87	8.91
Mar. 7 to 11,	5	96.00	15,640	18,473	25.39	4.31	5.09
Mar. 18 to 21,	4	60.00	8,510	10,702	16.13	3.69	4.64
May 7 to 10,	4	73.00	11,840	12,792	20.12	4.12	4.45
July 5 to 8,	4	78.00	9,620	11,654	23.13	2.91	3.52
July 24 to 25,	2	37.00	11,100	11,582	11.24	6.91	7.21
July 26 to 27,	2	21.00	1,850	2,392	6.52	1.98	2.56
Aug. 12 to 15,	4	66.00	7,770	8,521	21.06	2.58	2.83
Sep. 29,	1	24.	2,300	4,253	6.99	3.30	4.26
Sep. 30,	1	24.	1,440	1,569	7.10	1.42	1.55
Oct. 1,	1	8.30	370	620	2.27	1.14	1.91
Totals and averages,	38	647.00	106,220	121,212	182.50	4.07	4.65
1909:							
Jan. 6 to 8,	3	61.15	22,577	22,877	16.50	9.580	9.710
Jan. 10,	1	24.	740	....	6.07	.853	....
Jan. 11,	1	16.	370	....	4.18	.620	....
Jan. 12,	1	16.	270	....	4.20	.617	....
Jan. 20,	1	24.	370	....	6.36	.407	....
Jan. 25,	1	5.	370	....	1.15	2.250	....
Jan. 26,	1	24.	740	336	5.94	.872	.396
Jan. 27,	1	24.	740	620	5.83	.888	.744
Jan. 28,	1	24.	740	631	5.97	.868	.740
Jan. 29,	1	24	1,110	951	5.85	1.330	1.140
Jan. 30,	1	12.30	740	299	3.00	1.700	.677
Feb. 1,	1	24.	360	320	6.25	.400	.351
Feb. 2,	1	24.	360	300	6.24	.404	.336
Feb. 3,	1	24.	360	321	6.21	.406	.361
Feb. 4,	1	24.	360	303	6.18	.408	.343
Feb. 5,	1	24.	360	327	6.10	.413	.375
Feb. 6,	1	24.	360	311	6.00	.420	.363
Feb. 8,	1	24.	360	309	6.42	.392	.337
Feb. 9,	1	24.	360	....	5.86	.430	....
Feb. 10,	1	24.	....	307	6.12	....	.351
Feb. 11,	1	24.	360	....	5.86	.430	....
Feb. 12,	1	24	3,330	4,122	6.16	3.780	4.680
Feb. 13,	1	24	2,220	3,167	6.12	2,530	3,620
Feb. 14,	1	24	2,590	3,432	5.52	3.280	4.170
Feb. 15,	1	24	2,220	2,920	6.06	2.560	3.370

Treatment of Raw Water—Continued.

Date.	Days—Whole or part.	Hours—Absolute.	Coagulants used lbs.		Million gal. filtered.	Grs. per gal.	
			Alum	Soda		Alum	Soda
Feb. 16,	1	17	1,020	888	4.08	1.750	1.520
Feb. 17,	1	24	4.070	5,262	5.92	4.810	6.220
Feb. 18,	1	24	3,700	4,669	6.14	4.210	4.990
Feb. 19,	1	24	2,960	4,220	6.20	3.340	4.760
Feb. 20,	1	24	2,960	3,937	6.25	3.310	4.410
Feb. 21,	1	24	2,590	3,257	5.33	3.400	4.270
Feb. 22,	1	24	2,220	3,289	6.26	2.480	3.670
Feb. 23,	1	24	2,590	2,980	6.06	2.990	3.440
Feb. 24,	1	24	4,440	4,529	5.86	5.300	5.410
Feb. 25,	1	24	4,810	4,242	6.06	5.550	4.900
Feb. 26,	1	24	3,330	2,886	6.23	3.740	3.240
Feb. 27,	1	11	1,480	1,317	2.72	3.800	3.380
Mar. 7,	1	11	370	337	2.91	0.890	0.810
Mar. 10,	1	24	740	301	6.19	0.840	0.340
Mar. 11,	1	24	740	639	6.20	0.830	0.720
Mar. 12,	1	24	370	314	6.10	0.420	0.360
Mar. 13 to 14,	2	27.00	370	300	6.91	0.370	0.300
Mar. 15,	1	6	370	292	1.50	1.720	1.360
Mar. 18,	1	6	370	299	1.50	1.720	1.390
Mar. 26 to 28,	3	50.00	4,070	4,768	12.74	2.230	2.610
Mar. 29,	1	10	740	590	2.63	1.960	1.570
Apr. 22 to 24,	3	38.00	4,070	4,550	12.77	2.230	2.490
May 3,	1	15	1,110	1,133	4.24	1.810	1.860
June 15,	1	19.15	2,960	3,721	1.26	1.640	2.060
June 16,	1	24	4,810	4,523	7.07	4.760	2.470
June 17,	1	24	3,330	2,739	6.90	3.380	2.770
June 18,	1	24	2,590	2,136	6.80	2.660	2.190
June 19,	1	24	2,960	2,402	6.80	3.040	2.470
June 20,	1	24	2,960	2,370	6.10	3.390	2.710
June 21,	1	18	1,266	1,131	5.70	1.550	1.330
June 22 to 24,	3	41.00	4,690	3,844	12.14	2.700	2.210
June 25 to 28,	4	62.00	3,970	3,145	17.00	1.630	1.290
July 25,	1	12	1,480	1,500	2.70	3.830	3.880
Sept. 17 to 21,	5	103.00	12,210	13,908	30.08	2.840	3.240
Oct. 12,	1	9.00	1,480	1,500	2.70	3.800	3.880
Oct. 13 to 14,	2	13.30	1,110	1,200	3.75	2,070	2,240
Dec. 13 to 17,	5	94.00	17,020	17,221	21.47	5.500	5.610
Dec. 18,	1	8.30	740	594	1.42	3.650	2.930
Totals and averages,	84	1,594.00	155,433	158,786	412.84	2.630	2.690
1910:							
Jan. 21 to 24,	4	64.00	7,770	9,374	13.60	4.00	4.82
Feb. 17 to 19,	3	43.30	5,180	5,523	13.10	2.76	2.95
Feb. 21 to 24,	4	67.30	9,910	10,909	23.06	3.01	3.31
Feb. 27 to March 3,	5	96.00	7,630	7,571	26.97	1.82	1.96
April 19 to 22,	4	61.30	9,620	8,133	19.76	3.41	2.88
April 25 to 27,	3	53.00	4,070	3,329	15.27	1.87	1.52
May 25 to 26,	2	10.00	740	626	2.70	1.92	1.62
June 18, to 22,	5	85.00	12,950	10,676	29.58	3.06	2.56
July 10 to 15,	6	104	14,060	11,529	35.52	2.77	2.27
July 17 to 21,	5	106	11,470	9,448	34.15	2.35	1.88
Aug. 3 to 6,	4	67	8,880	7,689	23.12	2.68	2.33
Aug. 8 to 10,	3	43	2,960	2,486	16.60	1.24	1.04
Aug. 19 to 22,	4	76	5,920	4,637	13.45	3.08	2.41
Dec. 26,	1	10.30	740	590	2.76	1.87	1.49
Totals and averages,	53	887.00	101,300	92,520	269.64	2.62	2.39
1911:							
Jan. 2,	1	24	1,850	1,501	6.54	1.98	1.61
Jan. 3,	1	24	4,810	4,823	6.97	4.83	4.84
Jan. 4,	1	24	3,700	2,969	6.45	4.01	3.22
Jan. 5,	1	24	1,850	1,465	6.27	2.06	1.63
Jan. 6,	1	24	740	604	6.67	0.776	0.63
Jan. 30,	1	24	740	612	6.65	0.778	0.644
Jan. 31,	1	24	2,590	1,834	6.54	2.77	1.96
Feb. 1,	1	24	1,480	1,199	6.43	1.61	1.30
Feb. 2,	1	24	740	621	6.45	0.804	0.673
Mar. 29,	1	24	2,590	2,118	6.57	2.72	2.25
Mar. 30,	1	24	1,480	1,222	6.38	1.62	1.33
Mar. 31,	1	24	1,480	1,187	6.23	1.66	1.33
Totals and averages,	12	288	24,050	20,155	78.15	2.15	1.80

Grand Total.

Date—Year.	Days—Whole or part.	Hours—Absolute.	Coagulants used lbs.		Million gal. filtered.	Grs. per gal. Averages.	
			Alum	Soda		Alum	Soda
1906,	20	411.00	43,060	49,823	104.13	2.90	3.35
1907,	74	1,311.30	182,990	189,300	337.22	3.80	3.93
1908,	38	647.00	106,220	121,212	182.50	4.07	4.65
1909,	84	1,594.00	155,433	158,786	412.84	2.63	2.69
1910,	53	887.00	101,300	92,520	269.64	2.62	2.39
1911,	12	288.00	24,050	20,155	78.15	2.15	1.80
Grand total, April 1, 1911,	281	5,138.30	613,053	631,796	1,384.48	3.10	3.20

From the above table it may be calculated that chemical coagulants have been used 11.8 per cent. of the time since the filter plant was put into commission. Out of the six years covered by this period, or to be precise, 1,908 days, coagulants have been used on the whole of or parts of 281 days. The balance of the time the preliminary treatment of the water has consisted of plain subsidence.

It appears from the table that 631,796 pounds of soda have been used in 60 months or 5 years. This represents a cost of the material on the floor of the chemical house of $7,352.56, an expense wholly unnecessary, were facilities provided for proper sedimentation and coagulation. During roily periods of water the present preliminary treatment is not sufficient to effectively remove the sediment and in consequence an extra burden is placed on the filters requiring more frequent cleaning. It is estimated that the extra labor during these periods for filter cleaning amounts to 35 cents an hour. Since there are 5,138 hours during the five years, requiring coagulants, this represents an expenditure of $1,798.30 for extra labor in cleaning filters, which proper preliminary treatment of the water should largely eliminate. In other words, a total sum of $9,150.86 has been expended during 5 years or an annual sum of $1,830.17 which could have been saved. This expenditure is the interest at 5 per bent. of $36,603.00.

But this is not all. A filter plant cannot be expected to give high bacterial efficiency unless the sedimentation basins remove a greater part of the coarse and fine suspended matters. Furthermore, the addition of soda to an already alkaline water increases the hardness and the tendency of the formation of soft scale in boilers. Because the alkali carbonates in a hard water decompose considerable soap, it is generally desired that the raw water supply shall have not over 75 parts per million of alkalinity. The Conestoga waters average about 135.

C—Final Treatment.

The filter house is a brick structure, roofed over 264 feet long and 195 feet wide. It contains an influent chamber running the length of the building inside next the wall nearest the main drain and sedimentation basin. This chamber is of re-inforced concrete construction 7.75 feet high by 4.33 feet wide. It is provided with a 12-inch pipe for draining into concrete main drain in the yard outside. The water from the straining basins outside enters the influent chamber at the end opposite those basins and farthest from the creek. A branch on the 30-inch force main from the raw water pumps is connected with the opposite end of the influent chamber, through which the raw water enters when the coagulating plant and subsidence tanks are out of commission.

On the opposite side of the filter house from the influent chamber is a reinforced concrete effluent chamber next the wall and between these two chambers there is a row of filters 15 in number, each filter consisting of a primary and secondary filter, always operated in unison, one being the complement of the other. Each primary filter is 33 feet long and each secondary filter is 140 feet long and both are 16 feet wide.

The water enters the primary filter by an 8-inch pipe controlled by valve. These primary filters are called scrubbers. Each scrubber is drained by means of a 12-inch pipe passing under the influent chamber to the main concrete drain outside where there is a valve in the drain. Each scrubber is filled with filtering material to a depth of 58 inches. At the bottom of the scrubber which is of concrete construction, floor and sides, is an 8 inch layer of stone three to four inches in diameter supporting a four-inch layer of coke, egg size, then a four-inch layer of coke, stove size, and then a four-inch layer of coke, nut size. Over the coke is an 8-inch top layer of sponge held down by cedar racks secured in place by I beams bolted to the tops of the concrete wall. The water passes up through this filtering material and thence horizontally over the racks and a concrete wall onto the sand filter.

The top of this dividing wall between the scrubber and the secondary or sand filter is one foot lower than the side walls and about 2 inches above the surface of the filter material in the scrubbers. The normal water level is 6 inches deep over the wall when the entire filter, both primary and secondary units, is in operation. The base of the wall is 30 inches wide and laid in it extending across the entire length of the filter house, is a 16 inch cast iron pipe with 8-inch branches, one extending up a few inches to the bottom of a trough built in the dividing wall 13 inches wide and 32 inches below the top of the dividing wall next the scrubber and 8 inches below the side of the trench next the sand filter. The trench thus formed constitutes a drain to carry off wash water from the top of the sand bed. The 16-inch pipe empties into a catch basin outside of the building from whence the wash water is conveyed by pipe to the main concrete drain. Into this catch basin is inserted a quarter bend cast iron pipe connected to the 30-inch gravity main supplying filtered water from the reservoir to the pumping station. It operates as an air vent and its top is carried up 2 feet or more above the scrubber drain so that no waste water from the filter can pass into and contaminate the filtered water.

The 8-inch branches to the drainage trench are closed by inserting movable lengths of 8 inch pipe that extend above the surface of the water on the filters. In washing a sand filter the scrubber is shut off and the movable piece of 8-inch pipe is removed, allowing the wash water to enter the 16-inch drain. Any sand entering the main is intercepted at the catch basin and thus saved. Until recently, the pipe connecting the catch basin with the 30-inch filtered water main, led directly out of the bottom of the catch basin. Considerable sand found its way in this manner into the 30-inch pipe and thence to the town pumps where it caused trouble in cutting out valves, piston rods and plungers.

The object of this connection to the clear water main was to allow scrubber water to be sent to the pumping station in case of a breakdown in the sand filters or in case of an extra heavy demand for water during a fire. The placing of the quarter bend on the end of this pipe inside the catch basin prevents the use of scrubbed water ordinarily. But there is a plug handy that can be inserted in the drain which makes possible in an emergency the introduction of this practially filtered water into the town system.

The scrubbers are cleansed by opening the valves to the drains and allowing the water from the sand filter to flow back downward through the sponge and coke. These scrubbers are cleaned once a week or more frequently if occasion demands. As a rule, the sponges are flushed after every washing of the sand filter. The sponge is removed and washed once a year and at other times after a flood of very turbid water the reverse current is used. When the settling tanks are cleaned, the raw water is delivered directly to the scrubbers. This period is usually about 12 hours. The total area of the scrubbers is 8,400 square feet or about 0.2 acres. When the plant is operated at its rated capacity of 9,000,000 gallons in 24 hours, the rate of filtration through the primary filters is about 47,000,000 gallons an acre a day. It is reported that the bacterial efficiency of them ranges between 60 and 80 per cent. During times of high turbidity of the raw water, a very considerable quantity of mud is brought over from the preliminary treatment to the scrubbers.

The sand filter walls and floor are of concrete construction. The sand surface is 2 feet below the top of the side walls or level with the lower section of the dividing wall between the filter and the scrubber. The filtering materials are composed of a 24-inch top layer of ordinary filter sand, then a one inch layer of No. 5 gravel, a 2-inch layer of No. 4 gravel, a 3-inch layer of gravel, the size ranging from one-quarter of an inch to three-quarters of an inch, then a 4-inch layer of crushed stone 2 inches in diameter and then an 8-inch layer on the bottom of the crushed stone 3 to 4 inches in diameter. The water passes down through this 42 inches of material and is collected by a concrete drain laid on the filter floor. This drain is connected with the effluent chamber by an 8-inch pipe controlled by valves operated from a stand on the concrete covering of the chamber. The bottoms of these outlet pipes are about one foot above the bottom of the chamber. Loss of head gauges are attached to the outside wall of each filter and also sampling globes. The effluent chamber is 5 feet wide and about 6 feet deep. It is covered by a concrete floor on top of which is about level with the ground outside and about 6 inches above the floor of the filter. There is, therefore, a space of about 6 feet wide between the wall of the filter house and the wall of the sand filters, the top being 6 feet higher than this floor. This passage way is well lighted and affords convenient opportunity to inspect the loss of head gauge and to collect samples of water.

A re-wash pipe is connected with the outlet pipe of each sand filter in such a manner that any filter may be washed with filtered water from the others. This pipe is supported on columns in the effluent chamber about four feet above the bottom. The valves on the connections to this pipe are also operated by stands on the top of the effluent chamber.

The effluent chamber may be drained through an 8-inch pipe into an open ditch leading to the creek and the re-wash pipe may also be emptied into this ditch.

A 3-inch pipe under city pressure is also connected with the re-wash pipe for use in washing the sand filters.

The total area of the sand filters is 33,600 square feet, or about 0.77 acres. When the plant is operated at its rated capacity of 9,000,000 gallons in 24 hours, the rate of filtration through the sand filters is about 11,700,000 gallons an acre a day.

In the following table is given the average bacterial efficiency of the entire filter plant by weekly periods from the beginning of the year 1908 up to the week ending March 25, 1911. This shows the average bacterial efficiency to have been 98.73.

Average Bacterial Efficiency of Filter Plant. Weekly Report of City Chemist.

Week Ending.	Percentage, Bacterial Removal.	Week Ending.	Percentage, Bacterial Removal.	Week Ending.	Percentage, Bacterial Removal.	Week Ending.	Percentage, Bacterial Removal.
1908.		1909.		1910.		1911.	
Jan. 4,	97.68	Jan. 2,	99.05	Jan. 1,	93.32	Jan. 7,	96.55
Jan. 11,	90.07	Jan. 9,	95.55	Jan. 8,	96.05	Jan. 14,	99.83
Jan. 18,	93.78	Jan. 16,	92.14	Jan. 15,	96.97	Jan. 21,	99.83
Jan. 25,	96.66	Jan. 23,	93.78	Jan. 22,	96.92	Jan. 28,	99.92
Feb. 1,	93.99	Jan. 30,	96.01	Jan. 29,	97.06	Feb. 25,	99.54
Feb. 8,	83.93	Feb. 7,	95.42	Feb. 5,	98.75	Mar. 4,	99.83
Feb. 15,	94.95	Feb. 13,	97.20	Feb. 12,	98.36	Mar. 11,	99.80
Feb. 22,	93.57	Feb. 20,	99.28	Feb. 19,	97.28	Mar. 18,	99.94
Feb. 29,	96.41	Feb. 27,	99.09	Feb. 26,	95.48	Mar. 25,	99.87
Mar. 7,	96.64	Mar. 6,	97.61	Mar. 5,	97.58		
Mar. 14,	98.65	Mar. 13,	97.96	Mar. 12,	97.96		
Mar. 21,	98.27	Mar. 20,	97.61	Mar. 19,	99.60		
Mar. 28,	97.05	Mar. 27,	98.93	Mar. 26,	99.64		
Apr. 4,	98.78	Apr. 3,	98.19	Apr. 2,	99.77		
Apr. 11,	99.14	Apr. 10,	99.85	Apr. 9,	99.70		
Apr. 18,	98.80	Apr. 17,	99.79	Apr. 16,	99.73		
Apr. 25,	98.15	Apr. 20,	99.60	Apr. 23,	99.82		
May 2,	98.41	May 1,	99.69	Apr. 30,	99.48		
May 9,	99.07	May 8,	99.49	May 7,	99.52		
May 16,	98.33	May 15,	99.70	May 14,	99.57		
May 20,	99.15	May 22,	99.55	May 21,	99.62		
May 30,	99.06	May 29,	99.07	May 28,	99.76		
June 6,	99.44	June 5,	99.40	June 4,	99.81		
June 13,	99.56	June 12,	99.60	June 11,	99.80		
June 20,	99.72	June 19,	99.84	June 18,	99.89		
June 27,	99.38	June 26,	99.83	June 25,	99.78		
July 4,	99.47	July 3,	99.60	July 2,	99.81		
July 11,	99.75	July 10,	99.36	July 9,	99.13		
July 18,	99.14	July 17,	98.95	July 16,	99.88		
July 25,	99.70	July 24,	99.48	July 23,	99.84		
Aug. 1,	99.49	July 31,	99.19	July 30,	99.71		
Aug. 6,	99.52	Aug. 7,	99.04	Aug. 6,	99.88		
Aug. 15,	99.67	Aug. 22,	99.32	Aug. 13,	99.93		
Aug. 22,	99.58	Aug. 28,	99.62	Aug. 20,	99.92		
Aug. 29,	99.61	Sept. 4,	99.41	Aug. 27,	99.87		
Sept. 5,	99.58	Sept. 11,	99.51	Sept. 3,	99.87		
Sept. 12,	99.43	Sept. 18,	99.65	Sept. 10,	99.83		
Sept. 19,	99.45	Sept. 25,	99.72	Sept. 17,	99.83		
Sept. 26,	99.66	Oct. 2,	99.56	Sept. 24,	99.86		
Oct. 3,	99.80	Oct. 9,	99.61	Oct. 1,	99.82		
Oct. 10,	99.80	Oct. 16,	99.80	Oct. 8,	99.93		
Oct. 17,	99.88	Oct. 23,	99.68	Oct. 15,	99.77		
Oct. 24,	99.92	Oct. 30,	99.80	Oct. 22,	99.87		
Oct. 31,	99.83	Nov. 6,	99.92	Oct. 29,	99.85		
Nov. 2,	99.66	Nov. 13,	99.88	Nov. 5,	99.80		
Nov. 14,	99.83	Nov. 20,	99.91	Nov. 12,	95.17		
Nov. 21,	99.39	Nov. 27,	99.75	Nov. 19,	98.01		
Nov. 28,	99.87	Dec. 4,	99.42	Nov. 26,	97.93		
Dec. 5,	99.77	Dec. 11,	99.92	Dec. 3,	99.02		
Dec. 12,	99.10	Dec. 18,	99.73	Dec. 10,	99.40		
Dec. 19,	99.57	Dec. 24,	99.89	Dec. 17,	99.71		
Dec. 26,	98.71			Dec. 24,	99.58		
				Dec. 31,	98.88		

The company agreed that all water delivered to the city shall be filtered to the following standard:

"The annual average of the samples shall not contain more than 125 bacteria per cubic centimeter, and when river water contains more than 4,200 bacteria per cubic centimeter, the average bacteria purification shall not be less than 97 per cent."

So when there are 4,200 bacteria per c. c. in the raw water, 126 bacteria per c. c. or 97 per cent. removal is the standard. On this basis when there are 10,000 bacteria in the raw water, there shall not be over 300 bacteria in the filtered water and when there are 100,000 bacteria in the raw water, there shall not be over 3,000 bacteria per cubic centimeter in the filtered water. Such a number would, of course, render the filtered water extremely suspicious as a safe supply. The inference is that when water has less than 4,200 bacteria in it, the purification shall be more than 97 per cent. for the contract stipulates that the average for the year shall not exceed 125 in the filtered water.

Now referring to the last table it will appear that during January and February and the first part of March, 1908, the percentage of bacterial removal dropped below 97 and for one week averaged 83.93 per cent. To properly discuss this decline in efficiency it is necessary to have the daily records for reference. They are shown in the following table:

Daily Bacterial Efficiency of Filter Plant.

1908.	Total Bacteria per. c. c.		Percentage Bacteria Removed.	B. Coli.		Turbidity, Silica standard.
	Raw.	Filtered.		Raw.	Filtered.	
January 2,	2500	46	98.16	0	0	10
January 3,	3000	85	97.17	0	0	5
January 4,	1900	110	94.21	0	0	3
January 6,	1000	85	91.50	0	0	5
January 7,	6300	125	98.01	0	0	5
January 8,	63000	1300	98.00	present	0	200
January 9,	55600	4600	91.73	present	0	125
January 10,	12000	2250	81.25	present	0	20
January 11,	10200	2050	79.90	present	0	10
January 13,	71000	2650	96.27	present	0	600
January 14,	27000	1175	95.65	present	0	80
January 15,	12300	950	92.28	0	0	30
January 16,	6000	500	91.67	0	0	20
January 17,	7000	375	94.60	0	0	10
January 18,	3500	275	92.15	0	0	10
January 20,	3500	200	94.29	0	0	5
January 21,	3500	95	97.29	0	0	5
January 22,	7000	180	97.43	0	0	5
January 23,	4050	80	98.03	present	0	5
January 24,	2400	90	96.25	0	0	10
January 25,	3300	110	96.67	0	0	10
January 27,	2750	100	96.37	0	0	5
January 28,	13500	270	98.22	present	0	15
January 29,	11000	190	98.27	present	0	20
January 30,	4500	150	96.63	0	0	15
January 31,	1600	175	89.06	0	0	12
February 1,	13000	1900	85.39	0	0	10
February 3,	26500	3000	88.70	0	0	30
February 4,	39000	9000	76.93	0	0	20
February 5,	31000	7000	77.42	0	0	15
February 6,	22500	3400	84.89	0	0	15
February 7,	14500	1500	89.66	0	0	12
February 8,	11400	1600	85.96	0	0	10
February 10,	12000	1650	86.25	0	0	10
February 11,	13500	600	95.56	0	0	8
February 12,	8800	1330	84.89	0	0	8
February 13,	7800	475	97.89	present	0	7
February 14,	28400	600	93.91	0	0	40
February 15,	170000	15000	91.18	present	0	2000
February 17,	48000	6000	87.50	present	0	125
February 18,	20000	2250	88.75	present	0	40
February 19,	12000	775	93.54	0	0	25
February 20,	22700	570	97.49	0	0	50
February 21,	51000	1250	97.55	present	0	80
February 22,	35000	1150	96.71	present	0	75
February 24,	4500	150	96.67	present	0	25
February 25,	8900	250	97.20	present	0	18
February 26,	280000	1050	99.63	0	0	4000
February 27,	171000	1350	99.21	0	0	600
February 28,	44000	2100	95.23	0	0	150
February 29,	29000	2750	90.52	present	0	40
March 2,	3300	160	95.15	present	0	25
March 3,	7650	120	98.43	present	0	60

Daily Bacterial Efficiency of Filter Plant—Continued.

1909-10.	Total Bacteria		Percentage Bacteria Removed.	B. Coli.		Turbidity, Silica standard.
	Raw.	Filtered.		Raw.	Filtered.	
March 4,	11300	250	97.79	0	0	50
March 5,	10500	280	97.33	0	0	20
March 6,	6000	320	94.67	0	0	30
March 7,	3100	110	96.45	present	0	20
March 9,	104000	170	99.83	0	0	1000
March 10,	104000	150	99.85	0	0	400
March 11,	3950	125	99.68	present	0	125
March 12,	10250	325	96.83	present	0	60
March 13,	2650	75	97.17	present	0	40
March 14,	2400	35	98.54	present	0	30

There were 40 days out of the 63 days enumerated in the above table when the filtered water was below the 97 per cent. standard. There were 30 days of the 40 days when the raw water contained over 4,200 bacteria. The average raw water count was 26,632 and the average filtered water count was 2,570 for these 30 days, an average of 90.04 per cent. bacterial removal only. The greatest number of bacteria per c. c. in the filtered water was 15,000 while the least was 150.

There were 10 of the 40 days when the raw water contained less than 4,200 bacteria during which the average raw water count was 2,635 and the average filtered water count was 141 or 94.21 per cent. bacterial removal.

There were 15 days in the 63 days when the bacterial count in the filtered water was 125 or less but on 6 of these days the filtered water was below the 97 per cent. standard.

It should be noted that during high turbidity of the raw water the bacteria were present in the raw water in greatly increased numbers and that in every instance but one the bacteria in the filtered water increased greatly at the time or immediately thereafter indicating that the normal condition of the filters was disturbed. But at other times during these months when the turbidity was low the efficiency dropped the most. Cold weather quite universally affects filter efficiency throughout the country and a filter plant needs to be equipped and have sufficient extra capacity to take care of these conditions during such critical periods.

During January and the first half of February of the following year 1909, the efficiency of the plant was again below that guaranteed and for one week it averaged 92.14 per cent. only. The daily records during this period are shown in the following table:

Daily Bacterial Efficiency of Filter Plant.

1909.	Total Bacteria per. c. c.		Percentage Bacteria Removed.	B. Coli.		Turbidity, Silica standard.
	Raw.	Filtered.		Raw.	Filtered.	
January 4,	11000	75	99.32	present	0	5
January 5,	30000	45	99.85	present	0	5
January 6,	46500	100	99.78	present	0	300
January 7,	150000	750	97.50	0	0	200
January 8,	58500	1500	97.44	present	0	90

Daily Bacterial Efficiency of Filter Plant—Continued.

1909-10.	Total Bacteria		Percentage Bacteria Removed.	B. Coli.		Turbidity, Silica standard.
	Raw.	Filtered.		Raw.	Filtered.	
January 9,	46500	10500	77.42	0	0	60
January 11,	29000	3900	86.55	present	0	40
January 12,	32500	2800	91.39	0	0	25
January 13,	29000	2500	91.40	0	0	20
January 14,	10000	500	95.00	present	0	12
January 15,	60000	500	91.67	present	0	9
January 16,	9500	300	96.84	present	0	7
January 18,	3000	250	91.67	present	0	5
January 19,	3500	200	94.30	present	0	7
January 20,	2000	55	97.25	present	0	5
January 21,	3200	170	94.70	present	0	5
January 22,	2700	160	94.08	0	0	7
January 23,	1500	140	90.67	0	0	10
January 25,	2200	140	93.64	present	0	10
January 26,	7000	200	97.14	0	0	20
January 27,	4200	160	96.20	0	0	45
January 28,	14500	500	96.55	0	0	35
January 29,	14000	500	96.43	0	0	30
January 30,	9000	350	96.11	0	0	20
February 1,	6400	400	93.74	present	0	12
February 2,	4500	200	95.56	present	0	7
February 3,	4400	190	95.68	present	0	10
February 4,	3200	180	94.38	present	0	5
February 6,	2000	75	96.25	0	0	20
February 7,	2900	90	96.90	present	0	10
February 8,	2200	70	96.82	present	0	10
February 9,	1750	56	96.86	present	0	10
February 10,	1650	200	98.80	present	0	15
February 11,	45000	290	99.36	0	0	200
February 12,	25000	1450	94.20	0	0	120
February 13,	22500	600	97.33	present	0	100

There were 26 days out of the 36 days enumerated in the last table when the filtered water was below the 97 per cent. standard.

There were 14 days out of the 26 days when the raw water contained over 4,200 bacteria. The average raw water count was 21,021 and the average filtered water count was 1,756 for these 14 days, an average of 92.75 per cent. bacterial removal only. The greatest number of bacteria per c. c. in the filtered water was 10,500 while the least was 190.

There were 12 days out of the 26 days when the raw water contained 4,200 bacteria or less during which the average raw water count was 2,696 and the average filtered water count was 141 or 94.70 per cent. bacterial removal.

There were 10 days in the 36 days when the bacterial count in the filtered water was 125 or less but on seven of these days the filtered water was below the 97 per cent. standard.

It should be noted that the bacteria in the filtered water were present in greatly increased numbers immediately after the marked rise in turbidity on the 6th day of January and again on the 12th of February but again as in the year previous, and while the turbidity of the raw water was low, the bacterial efficiency remained far below par for days at a time, the longest period being 12 continuous days from January 27th to February 9th inclusive.

Again during the last 4 days of the year and during January and February of 1910, the efficiency of the plant was below standard, for one week dropping to 93.32 per cent.

The daily records during this period are shown in the following table:

Daily Bacterial Efficiency of Filter Plant.

1909-10.	Total Bacteria per. c. c.		Percentage Bacteria Removed.	B. Coli.		Turbidity, Silica standard.
	Raw.	Filtered.		Raw.	Filtered.	
December 21,	35000	1900	94.57	present	0	10
December 28,	29000	2000	93.10	present	0	10
December 29,	27000	2000	92.59	present	0	10
December 30,	27000	1600	94.07	present	0	10
December 31,	29000	2000	93.10	present	0	12
January 1,	24000	1800	92.50	0	0	10
January 3,	34000	1900	94.41	present	0	10
January 4,	46000	2200	95.22	present	0	8
January 5,	36000	1400	96.11	present	0	8
January 6,	36000	1200	96.67	present	0	6
January 7,	38000	1100	97.11	present	0	6
January 8,	41000	1300	96.83	present	0	6
January 10,	42000	1400	96.67	present	0	10
January 11,	56000	900	98.40	present	0	12
January 12,	46000	1500	96.74	present	0	15
January 13,	50000	2000	96.00	present	0	20
January 14,	26000	400	98.46	present	0	18
January 15,	2500	600	97.60	present	0	15
January 17,	17000	600	96.46	present	0	5
January 18,	20600	500	97.57	present	0	5
January 19,	75000	1500	98.00	present	0	20
January 20,	123000	3500	97.20	present	0	40
January 21,	150000	5000	96.67	present	present	400
January 22,	176000	8000	95.45	present	present	400
January 24,	56000	2700	95.08	present	0	45
January 25,	33000	1750	94.70	present	0	25
January 26,	26000	750	97.11	present	0	15
January 27,	26000	550	97.88	present	0	12
January 28,	18000	250	98.61	present	0	8
January 29,	22000	250	98.86	present	0	5
January 31,	1000	100	99.00	present	0	10
February 1,	11000	100	99.09	present	0	7
February 2,	10500	175	98.33	0	0	5
February 3,	8500	125	98.53	0	0	5
February 4,	12700	170	98.67	present	0	12
February 5,	13500	150	98.89	present	0	12
February 7,	11200	125	98.88	0	0	8
February 8,	12000	160	98.67	0	0	7
February 9,	11600	250	97.84	0	0	5
February 10,	18000	350	98.06	present	0	5
February 11,	19000	300	98.42	0	0	5
February 12,	18000	300	98.33	0	0	5
February 14,	25000	650	97.40	0	0	5
February 15,	19000	500	97.37	0	0	7
February 16,	16000	400	97.50	0	0	15
February 17,	70000	1800	97.43	0	0	30
February 18,	150000	4000	97.33	0	0	200
February 19,	90000	3000	96.67	0	0	50
February 21,	89000	4000	95.52	0	0	200
February 22,	112000	1900	98.30	0	0	250
February 23,	67000	3000	95.52	0	0	175
February 24,	45000	1500	96.67	0	0	50
February 25,	17000	1000	94.12	0	0	30
February 26,	18000	1300	92.78	0	0	15

There were 25 days out of the 54 days enumerated in the last table when the filtered water was below the 97 per cent. standard. On all of these days the raw water contained over 4,200 bacteria, the average count being 50,400 and the averaged filtered water count being 2,242, an average of 95.05 per cent. bacterial removal. The greatest number of bacteria per c. c. in the filtered water was 8,000 and the least 600.

There were 4 days only in the 54 days when the bacterial count in the filtered water was 125 or less and on these 4 days the filtered water was above the 97 per cent. standard. Again it is noted that when the turbidity of the raw water was high, the bacteria in the raw and filtered water were present in greatly increased numbers and that on January 21st and 22nd, B. coli were present in the filtered water. It will also be observed that there were 15 successive days from December 27th to January 10th, inclusive, when the turbidity was very low, that the bacterial efficiency was also low.

In the latter part of January 1909, and following on for sometime, a solution of copper sulphate, one part in a million by weight, was introduced into the influent chamber to aid in the destruction of bacteria. During critical times the officer in charge has on several occasions in cold weather applied equal parts of alum and soda to the surface of the sand filters immediately after cleaning. This forms a coating and aids the work of the filter in removing bacteria. This process has been applied all through the winter just passed. In the following table are given daily records of the filter efficiency when the percentage of bacterial removal was below 97, or when the turbidity was high, or when B. Coli were found in the filtered water for the fall and winter of 1910-11.

Daily Bacterial Efficiency of Filter Plant.

1910-11.	Total Bacteria per. c. c.		Percentage Bacteria Removed.	B. Coli.		Turbidity, Silica standard.
	Raw.	Filtered.		Raw.	Filtered.	
August 3,	68000	6	99.91	present	0	800
August 4,	340000	75	99.98	present	0	2600
August 5,	78000	25	99.97	present	0	1200
August 6,	13000	7	99.95	present	0	190
August 9,	80000	20	99.98	present	0	300
August 10,	26000	6	99.98	present	0	200
August 20,	30000	10	99.97	present	0	650
November 5,	19000	40	99.74	present	0	60
November 6,	57000	5500	91.79	present	present	40
November 7,	42000	2700	93.57	present	present	40
November 8,	44000	1500	94.32	present	0	30
November 9,	16000	400	97.50	present	0	20
November 10,	20000	400	98.00	present	0	24
November 11,	12000	300	97.50	present	0	24
November 12,	7700	500	93.51	present	0	20
December 22,	40000	800	98.00	present	present	30
December 23,	30000	5	99.98	present	0	24
December 26,	130000	1000	99.23	present	present	24
December 27,	89000	2300	97.42	present	present	30
December 28,	82000	1000	98.78	present	present	24
December 29,	90000	900	99.00	present	0	16
December 30,	75000	25	99.96	present	0	16
January 2,	120000	5	99.99	present	0	220
January 3,	165000	450	99.73	present	0	350
January 4,	104000	5500	94.71	present	present	100
January 5,	68000	3200	95.30	present	present	60
January 6,	21000	1700	90.90	present	present	40
January 7,	46000	600	98.70	present	0	30

There were 4 days in November and 3 days in January of this last winter when the bacterial efficiency was below 97 per cent. and on 5 of these days B. Coli were present in the filtered water. There were also 4 days in December when B. Coli were present in the filtered water although on those days the efficiency was above 97 per cent. The decline in the efficiency of January 4, 5 and 6, followed the sudden rise in turbidity of the two previous days.

The notable decline in efficiency the first part of November was unaccompanied by any change in the turbidity of the raw water. An alum soda solution was applied to the surface of the sand beds after washing and this was kept up until about the first of April. Compared with other winters, the output of filtered water has been freest from bacteria. From November 1st, to March 25th inclusive, excluding the time from January 29th to February the 20th. inclusive, when the city chemist was ill, and no samples of water were analyzed by him, there were 103 days on which samples of water were collected and analyzed. These samples show an average of 20,360 bacteria in the raw water and 301 bacteria in the filtered water. There was an average of 98.98 per cent. removal of bacteria. The turbidity during these days averaged 18.

The yearly average since the filter plant has been installed for that period in the filtered water has not exceeded 125, the contract guaranteed. The average for 336 days for which particular details have been mentioned herein covering the periods of least efficiency of the plant has been 661 bacteria per c. c. The critical examination of the records for these periods has been given to show wherein the filter operation is weakest and to point out the necessity for an improvement of the plant as a whole.

d—Filtered Water Reservoir.

From the end of the effluent chamber a 30-inch main leads to the filtered water reservoir located between the filter building and the creek. A 30-inch gate on this line can be used to shut off the flow to the reservoir and send it direct from the filters to the pumping station by means of a 30-inch main laid between the reservoir and the filter house and connecting with the filtered water main from the reservoir.

This reservoir is an open re-inforced concrete structure with vertical buttress walls. It is 198 feet long by 100 feet wide and 12.5 feet deep. The capacity at the high water line maintained by an overflow 1.4 feet below the top of the wall is 1,650,000 gallons. The water is admitted at the top at one corner through a vertical 30-inch pipe carried up a few inches above the high water mark over the rim of which the water flows weir fashion. The outlet is in the bottom at the corner diagonally opposite from the inlet and on the side next to the creek. It is 30 inches in diameter and extends under the creek to the pumping station. When the reservoir is full the water is delivered to the pumps under a 13.5 foot head. The reservoir supply can be cut off by the use of the gate on the main near the reservoir and between this gate and the reservoir is a 16-inch connection to the main filter plant drain for use in draining and cleaning the reservoir.

Some algae growth has been observed but this has not caused any serious trouble. Occasionally, as required, the water had gone down and sides and bottom have been cleaned to prevent a luxuriant growth. The permanent remedy for this trouble should it become serious would be to exclude light by covering the reservoir.

6. State Tests of Water.

At various times the State Department of Health has collected samples of water at the filter plant and about the town and has analyzed them bacteriologically.

Seventeen samples were collected on October 7th, 1908. The results of the tests were as follows:

Location.	Number Samples.	Bacteria per c. c.	
		Total.	B. Coli.
Raw water,	2	350	0
	....	11350	0
Influent chamber,	2	600	0
	....	300	0
Effluent No. 1 Scrubber,	2	100	0
	....	900	0
Effluent No. 6 Scrubber,	2	230	0
	....	3300	0
Effluent No. 1 filter,	2	160	0
	....	250	0
Effluent No. 6 filter,	2	290	0
	....	840	0
Effluent chamber,	5	150	0
	....	185	0
	....	140	0
	....	360	0
	....	525	0
Averages.			
Raw water,		5850	0
Subsided water,		450	0
Scrub water,		1132	0
Effluent from 2 filters,		385	0
Effluent all filters,		272	0

There appears to be an increase of bacteria in the effluent chamber. It has been noted by city chemist. Samples taken farthest from the entrance show more than those near it. This is due, perhaps, to stagnation of the surface water since samples taken from below the surface show less or no increase in bacteria. The remedy might be the insertion of a few baffles in the chamber to keep the water in circulation.

Forty-one samples were collected during the last 4 days of April, 1909, at the filter plant and about town. The results of the tests were as follows:

Location.	Number Samples.	Bacteria per c. c.	
		Total.	B. Coli.
Raw water,	4	210 280 140 160	0 0 0 1
Influent chamber,	2	85 200	0 0
Effluent No. 1 scrubber,	1	100	0
Effluent No. 2 scrubber,	1	74	0
Effluent No. 3 scrubber,	1	82	0
Effluent No. 4 scrubber,	1	81	0
Effluent No. 5 scrubber,	1	100	0
Effluent No. 13 scrubber,	1	48	0
Effluent No. 14 scrubber,	1	130	0
Effluent No. 15 scrubber,	1	65	0
Effluent No. 12 scrubber,	1	50	0
Effluent filter No. 1,	2	30 53	0 0
Effluent filter No. 2,	2	65 74	0 0
Effluent filter No. 3,	1	630	5
Effluent filter No. 4,	2	21 21	0 0
Effluent filter No. 5,	2	18 12	0 0
Effluent filter No. 6,	1	48	0
Effluent filter No. 7,	1	48	0
Effluent filter No. 8,	1	26	0
Effluent filter No. 9,	1	350	0
Effluent filter No. 10,	1	16	0
Effluent filter No. 11,	1	38	0
Effluent filter No. 12,	1	21	0
Effluent filter No. 13,	1	22	0
Effluent filter No. 14,	1	22	0
Effluent filter No. 15,	1	18	0
Effluent chamber,	1	2400	0
Clear water basin,	3	32 20 14	0 0 0
Taps about town,	3	12 63 16	0 0 0
Averages.			
Raw creek water,		198	1
Subsided water,		143	0
Scrub water 1 scrubber,		50	1
Scrub water 8 scrubbers,		85	0
Effluent 1 filter,		630	5
Effluent 14 filters,		53	0
Filtered water Effluent chamber,		2400	0
Filtered water Clear water basin,		22	0
Filtered water Taps about town,		30	0

The sample from filter No. 3 containing 630 bacteria and 5 B. Coli was collected 10 hours after the sand had been washed. Once each year the sand in each filter of the plant is dug up and washed thoroughly by means of a movable mechanical washer placed directly over each bed. The sand washing machine consists of a revolving cylinder driven by a gasoline engine. Inside of the cylinder is a spiral arrangement with a slight slope. The sand works its way out of the cylinder against the water by means of a spiral. The finer waste material passes away with the water. Not enough care was exercised in putting this filter into operation again

The ordinary washing of the sand surface of each bed is accomplished by another machine suspended the width of the filter and moved by an engine back and forth lengthwise. It has agitator teeth attached to a board. These teeth sink into the sand about three inches and break up the crust of sediment. On the opposite end of the car from the teeth is a smooth board used to even the surface after agitation. The filters have re-wash connections, but these, it is reported, are seldom used.

No guarantee of efficiency for short intervals of time is made by the filter company. To be sure the average bacteria in the filtered water for the year shall not exceed 125. Furthermore, when the raw water contains 4,200 bacteria or over, the efficiency shall not be less than 97 per cent. There is no statement as to what it shall be when the raw water contains less than 4,200 bacteria. except as noted that the average for the year shall not exceed 125 bacteria in the filtered water. Hence for a single day the delivery of very unsafe water into the system would not be contrary to the contract. Filter companies universally make such guarantees because the efficiency of a plant, well designed, depends almost entirely upon the care and intelligence with which it is operated. The point emphasized is that more expert supervision is demanded in the operation at the Lancaster filter plant.

Nine samples were collected and analyzed by the Department later in the year of 1909. The results were as follows:

Location.	Number Samples.	Bacteria per c. c.	
		Total.	B. Coli.
Taps about town, June 24 and 29, 1909.	2	18	0
		28	0
Distributing reservoir,	1	550	0
Taps about town, August 15, 1909,	6	2000	0
		1900	0
		350	0
		400	0
		2000	0
		1200	0

Twenty-Three Samples Were Collected by the Department on April 25, 1911. The Results of the Tests Were as Follows:

Location.	Number Samples.	Bacteria per c. c.	
		Total.	B. Coli.
Raw creek water,	3	3500	50
		720	60
		1500	8
Effluents Scrubber No. 1,	2	2400	16
		1800	30
Effluent filter No. 1 before washing,	1	220	2
Effluent filter No. 1 after washing,	1	240	0
Effluent filter No. 4 before washing,	1	40	1
Effluent filter No. 9,	1	8	0
Effluent chamber,	2	16	0
		50	0

Location.	Number Samples.	Bacteria per c. c.	
		Total.	B. Coli.
Distributing reservoir low service,	4	84	0
		8	0
		6	0
		4	0
Stand pipe high service,	1	36	0
Taps in town,	7	100	0
		80	0
		20	0
		8	0
		160	0
		90	0
		20	0
Averages.			
Raw water,		1907	39
Scrubbed water,		2100	23
Effluent from 3 filters,		104	1
Effluent chamber,		33	0
Filtered water about town,		51	0

It rained on April 4th and during that night the creek water became turbid. Coagulants were being used at the time the samples were collected on April 5th. It will be noted that the water from filters No. 1 and 4 contained B. Coli before the surface of these beds were cleaned. More attention should be paid to the loss of head gauges in determining the time for washing the filter beds. During freezing weather these glasses have to be put out of operation. Some substitute should be provided during such time. The re-washing connection should also be used after surface washh. These criticisms are not factitious. They would be suggested by any expert placed in responsible charge of the plant. There is no apparatus devised by man that does not require attention and that cannot be improved. The maintenance of so important a thing as a water purification plant should embody the making of little improvements and additions as the seasons go by.

7. Chlorinated Lime Treatment.

Recently considerable agitation of a public nature has prevailed in Lancaster relative to the application of a solution of chloride of lime to the water at the filter house after filtration.

The following communication was received from the "Lancaster Daily Examiner" on March 30th, 1911:

"Dr. Samuel G. Dixon,
"State Health Commissioner, Harrisburg, Pa.

"Dear Sir:—The Examiner has incontrovertible evidence that the water supply of Lancaster City is doctored with chloride of lime after it leaves the final process of filtration. The story is set forth in to-day's issue of the paper, a copy of which has been sent you. All the evidence in our possession is at your command, if it is the province of your Department to proceed in the matter and you should think it proper to take official action.

"Sincerely yours,
"W. FRANK GORRECHT."

The Mayor also asked the Commissioner of Health to review the situation and express his conclusions in writing. The reply to this request was as follows:

"April 3rd, 1911.

"Hon. Frank B. McClain,
"Mayor, Lancaster, Pa.

"My Dear Mayor:—Your letter of April 1st, was received by me this morning upon my return to Harrisburg. I have at once sent my Chief Engineer, two assistants and a medical man to Lancaster to investigate the situation there.

The one mistake that I see on the face of the matter is that the consent of the State should have been obtained before any new process or extension of the filter plant had been made.

"Hoping that we may find that the chemical was added in proper quantities so that it might not in any way effect the health of the citizens, I am,

"Yours very truly,
"SAMUEL G. DIXON."

The contention of the "Examiner" summarized is substantially as follows:

First: That no application was made to the State Department of Health for permission to use the chemical.

Second: That the apparatus used at the Lancaster filter plant was crude and that no one could have had a definite idea as to the amount of chemical fed into the water.

Third: That the hypo-chlorite was added at certain periods in quantity approximately 0.5 to 0.65 grains to the gallon, or 50 times as great as the figure given by the city chemist.

Fourth: That this process may imperil the health of every one using city water, since the effect of chloride of lime coming daily in sufficient quantity would be to keep up a constant irritation of the lining of the stomach and cause stomach disorders.

Fifth: That an unusual number of stomach disorders have been prevalent according to the report of some doctors.

Sixth: That the city chemist collects for analysis the sample of water after it has been treated with the chemical.

Seventh: That a solution sufficient in strength to destroy all bacteria was put into the water and that this gave to the filter plant a false credit and rating on bacterial efficiency.

Eighth: And, that the filtered water is not the proper place in which to put chloride of lime. In other filter plants the chemical is introduced into the water before it reaches the filters.

The use of oxygenated chlorine compounds for the destruction of objectionable forms of bacterial life in polluted waters, although not new, has come into prominence during the last three years. The efficiency of various germicides in sterilizing sewage was studied by the German Government during the Hamburg cholera epidemic of 1892 and it was reported that hypo-chlorite of lime was the most satisfactory chemical for this purpose.

Chlorinated lime was used during and following the epidemic of typhoid fever at Maidstone, England, in 1897, for sterilizing the water distributing system. Also at Lincoln, England, in 1904, during a typhoid fever outbreak, hypo-chlorite of soda was supplied to the public water by Drs. Houston and McGowan, members of the staff of the Royal Commission on Sewage Disposal.

Ozone and copper compounds have been used, the latter more particularly, for the destruction of bacterial life in public water supplies during epidemics. A considerable amount of data has been secured from the use of oxygenated chlorine compounds for the treatment of water during epidemics in Belgium. The efficacy of these compounds as germicide agents has been established.

The first extended use of hypo-chlorite of lime in America for the treatment of a water supply was at the Chicago Stock Yards during the summer of 1908. Before the use of the hypo-chlorite of lime, copper sulphate was the germicide used. While the initial germicidal action of the copper compound was satisfactory, the subsequently filtered water still contained high quantities of organic matter which deposited in the clear water reservoir, promoted active bacterial life and this restocked the filtered water with bacteria, imparting noticeable odor to the water. Upon the substitution of hypo-chlorite of lime, the deposits of organic matter in the clear water reservoir ceased, the effluent lost its sewage odor, was clear and well oxygenated and the germicidal action was quite as positive as when copper sulphate was used.

On a much larger scale this germicide is being used notably in the treatment of the unfiltered water supply of Jersey City. Forty million gallons daily are so treated.

There are numerous towns of considerable size whose water supply, unfiltered, is being treated similarly. Ordinarily commercial bleaching powder is bought in bulk and stored. The dry powder as wanted is dissolved in concrete tanks. A certain percentage only of the material in the bleaching powder is soluble. The unsoluble material remains in the tank as sludge or as a coating on the surface and has to be removed. An agitating device operated by power is installed in the dissolving tank from which the solution is piped to the dosing tank where the proper proportion of the solution is measured by apparatus that delivers the chemical to the water to be treated. While such a sterilizing tank may be made nearly automatic, constant attention is required in the operation and chemical and baectrial tests should be made frequently to determine the strength of the solution and the composition of the raw and treated water.

High grade bleaching powder contains about 35 per cent. of available chlorine, so-called, corresponding to about 8 per cent. available oxygen. This powder consists of chloride of calcium and hypo-chlorite of calcium. The former salt remains inert when added to water, while the latter combines with the carbonic acid of the water and separates into calcium carbonate and hypo-chlorous acid. The latter is extremely inert; nevertheless, as an oxidizing agent it is powerful by virtue of the liberation of atomic oxygen which it readily gives up in the presence of oxidizable substances because of its instability as a chemical compound. It is this liberated nascent oxygen that effects the destruction of bacterial life.

In the decomposition of hypo-chlorous acid, free hypo-chloric acid remains which drives out the weaker carbonic acid and unites with the calcium, forming chlorides of calcium. The total solid matter in the water and the total hardness will therefore, be slightly increased, although the differences in the physical and chemical characteristics of the water before and after treatment should be slight. It is asserted occasionally that free chlorine may persist in water treated by this process. As long as the water is akaline, no free chlorine can exist.

Chlorinated lime is used and approved by the State Department of Health in stamping out epidemics of a water-borne nature and in the treatment of unfiltered water in a few instances. However, it is contrary to good public policy to encourage the promiscuous use of chemical disinfectants of public water supplies

The apparatus was crude but exactly similar to that set up by the State Department of Health for emergency purposes at other places during epidemics where water has been disinfected. The apparatus was installed by the filter company for temporary use only. The city chemist advised a permanent installation but the company did not admit the necessity for a permanent sterilizing plant. The apparatus in itself was sufficient for emergency use.

The instaliation came about in this manner.

Early in November, as previously shown, the bacterial efficiency of the filter plant dropped off suddenly and not only were there excessive numbers of bacteria in the filtered water but there were B. Coli present also. The mayor who receives the weekly reports from the city chemist, noting this deficiency, called the city chemist's attention to it and inquired if there were not some further treatment or remedy to be had. The chemist suggested the hypo-chlorite treatment. Then the mayor and the chemist took up with the filter company the matter of installing the requisite apparatus. The mayor's object was as he stated it, to use a quick remedy to safeguard the public health. He had been watching the weekly reports carefully since assuming the duties of his office and in November was the first time the efficiency had dropped below the 97 per cent. standard. The emergency apparatus was set up and used for the first time on December 10, 1910, and it was used every day to and including March 30th, 1911, less 16 days. On these 16 days, in the opinion of the company, the quality of the raw water was such that it was not deemed necessary to use the lime solution. The records show that in December 1910, the company purchased 200 pounds of bleach and on January 11th, 1,412 pounds additional, making a total of 1,612 pounds of which 1,379 pounds were used elaving on hand 233 pounds. The bleach used is equivalent to 9,653,000 grains.

The quantity of water filtered during this time was as follows:

December 10, 1910 to January 1st, 1911, ...	152,900,000 gallons.
January 1st to February 1st, ...	202,850,000 gallons.
February 1st to March 1st, ...	180,190,000 gallons.
March 1st to March 31st, ...	193,440,000 gallons.
Making a total of, ...	729,380,000 gallons.

During this period chloride of lime was not used on 16 days during which 16 days 100,000,000 gallons of water were filtered, leaving a balance of 629,380,000 gallons to which was applied 9,653,000 grains, or fifteen thousandths of a grain to a gallon. This is all the chloride of lime that was ever used at the plant, so far as the Department is able to ascertain.

The chemist's intention was that 0.5 grains of powder to the gallon of filtered water should be used. This would be equivalent to 7.14 pounds of the bleaching powder to one million gallons; but this quantity was not used.

The superintendent testifies that he would put 12 pounds of powder into the upper or mixing barrel and stir it up with a hand paddle occasionally until all of the soluble material was dissolved and then he would draw off this saturated solution either quickly or slowly as the case might be, into the lower barrel. Sometimes when the sediment had collected in the upper barrel it would be removed bodily to outside the filter house and the sediment would be dumped out onto the ground. The superintendent says, however, that he never used more than 24 pounds of powder in one day of 24 hours and that he never applied the solution at a rate greater than two vertical inches per hour in the lower barrel. This would be well within the limits and at about one half the rate which the chemist figured upon.

The State Department of Health usually applies bleach to unfiltered waters during epidemics at between four and five times the rate testified to by the superintendent and sometimes when such raw water is turbid between 12 and 15 times the rate testified by the superintendent.

The apparatus at the Lancaster plant was set up over the effluent chamber at the end of the passage way farthest from the clear water basin, so that the effluent from each filter as it flows into the effluent chamber would be subjected to contact with the disinfectant.

Taking up the contentions hereinbefore mentioned in order:

First: That no application was made to the State Department of Health for permission to use the chemical.

This is correct. But under the circumstances justifiable.

Second: That the apparatus used at the Lancaster filter plant was crude and that no one could have had a definite idea as to the amount of chemical fed into the water.

This is true if the word "definite" is understood to mean "precise." A substantial, accurate idea was had, practical enough for an emergency, but there was too great opportunity for error to admit of approving the methods for a permanent installation.

Third: That hypo-chlorite was added at certain periods in quantity approximately 0.5 to 0.65 of a grain to the gallon, or 50 times as great as the figures given by the City Chemist.

This assertion is denied absolutely by the attendant at the filter plant. There was no necessity to use so much, and to save cost the company ordered very much less used than the chemist advised. If 0.5 of a grain was used it was directly contrary to the economic policy pursued by the company and must have been a mistake of short duration. Three-tenths of a grain have been intentionally used by this Department in some instances where the water was pumped directly into the service mains. Five-tenth of a grain would be absorbed by the filtered water at Lancaster.

Fourth: That this process may imperil the health of every one using city water, since the effect of chloride of lime coming daily in sufficient quantity would be to keep up a constant irritation of the lining of the stomach and cause stomach disorders.

The Associate Medical Inspector, Dr. Hunt, of the Department, made a special investigation, interviewing numerous city doctors and running down all reports of stomach and bowel disorders having a possible relevancy to the public water. The result showed the report to be unfounded. As will be shown hereinafter typhoid fever as an index of water-borne diseases has been greatly reduced since the filter plant was put in operation.

Complaints of several years standing have risen that the filtered water contains alum. They are founded on trouble with sediment in boilers and pipes and warm water spigots. This, it is believed, is due to excess of carbonates in the water. As previously shown, the natural creek water is high in carbonate. Soda ash is added in order to make the water excessively alkaline at the time of coagulation at the filtration plant. Owing to lack of sedimentation capacity this has been found to be necessary. The addition of soda increases the tendency to soft scale and deposit in the pipe system of the streets and buildings of the city. People who live in towns supplied with much harder water than Lancaster gets have ordinary good health, but this should not be an argument in favor of unnecessarily freighting the water with foreign substances

Fifth: That an unusual number of stomach disorders have been prevalent according to the report of some doctors.

This has been shown to be incorrect for the period covered by the use of chlorinated lime according to investigations thus far made by the medical officer above referred to.

Sixth: That the city chemist collects for analysis the sample of water after it has been treated with the chemical.

The city chemist does not deny this statement. The sampling during the lime treatment was done at the same point where collections have always been made before the lime treatment was resorted to. Its object is to determine the purity of the total output of the filters and the point for collection is just beyond where the last filter discharges its effluent into the filtered water chamber.

Seventh: That a solution sufficient in strength to destroy all bacteria was put into the water and that this gave to the filter plant a false credit and rating on bacterial efficiency.

All of the bacteria were not destroyed in the filtered water treatment with the lime. On seven days during the treatment B. Coli were present in the filtered water as shown by the reports of the city chemist. Undoubtedly a very great destruction of bacteria must have been accomplished through the use of the disinfectant. But a stronger solution might have been used with safety. This goes to prove that without the use of the chemical a dangerously polluted supply would have been furnished to the public since sewage pollution was present constantly in the raw water. The mayor should be commended for his prompt attention in the matter early in November. It is immaterial, as far as credit on bacterial efficiency of the filter plant alone is concerned, whether the germicide were applied before or after filtration.

Eighth: And, that the filtered water is not the proper place in which to put chlorite of lime. In other filter plants the chemical is introduced into the water before it reaches the filters.

It is as proper to apply the chemical to the filtered water as it is proper to apply a germicide to an unfiltered water supply. In fact a weaker solution can be used, its strength can be much more constant and the regulation of the quantity supplied is simpler, when the process is applied to the filtered water. Owing to the great range and sudden changes in the quality of the creek water, the introduction of chlorinated lime into the raw water in proper strength and quantity would be a complicated problem. Much more powder would have to be used; but the best place for the Lancaster plant is a subject that should be determined by experiments and this again emphasizes the necessity for supervision by the chemist of the filter plant operation.

8. The Filter Plant as a Public Health Safeguard.

The value of the water filter plant to the public is indicated by the effect on public health represented by the marked decline in typhoid fever in Lancaster since the improvement was made. In the following table are given the typhoid fever records of the city Board of Health for the last ten years.

Cases of Typhoid Fever Reported to City Board of Health.

Month.	1900	1901	1902	1903	1904	1905	1906	1907	1908	1909	1910	1911
January,	13	9	18	14	33	6	80	0	6	0	1	0
February,	11	10	32	17	30	17	7	3	2	1	0	0
March,	25	0	16	21	36	6	12	5	2	1	1	2
April,	26	11	16	19	25	23	3	2	2	0	4	....
May,	12	7	10	40	38	9	11	0	1	2	3	....
June,	4	3	7	15	2	1	5	0	0	63	1	....
July,	7	15	16	55	22	5	8	2	9	22	6	....
August,	3	6	20	32	27	6	11	13	4	25	16	....
September,	9	8	15	6	16	10	9	7	8	12	3	....
October,	10	13	11	4	12	8	6	6	6	11	3	....
November,	5	2	25	5	8	8	3	3	5	4	2	....
December,	7	6	9	7	3	95	2	3	5	6	0	....
Total,	132	90	195	235	254	194	156	43	50	147	40	....

For 1909, the cases in the above table differ by months from the report of cases hereinbefore given under discussion of the typhoid outbreak in the eastern part of the city during the summer due to polluted well water. The difference may be largely explained by probable errors in diagnosis and hence errors in reports. Many of the cases were undoubtedly paratyphoid.

It is evident that the sewage polluted water of the Conestoga Creek containing as it did typhoid infection was the cause of typhoid fever to a large extent in Lancaster while this infected water was furnished unpurified to the public. Furtherefore, the sudden dropping off in cases immediately following the installation of the filter plant and the continued low rates prove the proposition; but the disease has not been entirely eradicated since there are other mediums of transmission of disease than the public water. The normal occurrence of the disease since the filter installation, is shown in the following table.

Normal Typhoid Fever Cases by Months Since April 1, 1906.

Since April 1, 1906.		For 1909.	
April, (5 years period),	2.3	One month period,	0 cases reported
May, (5 years period),	3.4	One month period,	2 cases reported
June, (4 years period),	1.5	One month period,	2 normal
July, (4 years period),	6.3	One month period,	6 normal
August, (4 years period),	11.0	One month period,	11 normal
September, (5 years period),	7.8	One month period,	8 normal
October, (5 year period),	6.4	One month period,	6 normal
November, (5 year period),	3.4	One month period,	4 cases reported
December, (5 year period),	3.3	1910,	6 cases reported
January, (5 year period),	1.4	1910,	1 case reported
February, (5 year period),	1.3	1910,	0 cases reported
March, (5 year period),	2.3	1910,	1 case reported

June, July and August of 1909 were not included in the 5-year averages for the reason that most of the 133 cases reported for those months and for September and October of that year were paratyphoid or some other disease representing other than normal typhoid fever conditions. In other words, if included, they would take away from the credit to the filtered public water supply that value for the normal security from typhoid for which the comparison is being made. So in the last column of the table above is given the averages for 4 years as representing the said value for the questioned period in 1909.

The cases then for each year from April 1st to April 1st, since the filter installation and prior to it, and the percentages of reduction in typhoid fever will be as follows:

	Since Filter Installation.		Before filter installation.	Percentage Reduction.
First 12 months,	65	First 12 months,	264	75
Second 12 months,	45	Second 12 months,	185	76
Third 12 months,	42	Third 12 months,	282	85
Fourth 12 months,	47	Fourth 12 months,	179	74
Fifth 12 months,	40	Fifth 12 months,	123	67
Total cases,	239	Total cases,	1032	77
Yearly average cases,	48	Yearly average cases,	206	....

So the average percentage of typhoid fever reduction fairly attributable to the water filter plant is 77 per cent.

There were 2 cases of typhoid only reported during the period that chlorinated lime was introduced into the filtered water.

9. Proposed City Improvements to the Water Works System.

The application made by the mayor on April 5th, 1911, represents as follows:

"That the plans accompanying this application show the installation of a proposed emergency pumping plant at the East End Reservoir, and the sanitary dam on the Conestoga Creek at the pumping station ordered to be built by decree of the Commissioner of Health, same submitted with descriptions for approval. And the city also asks for permission to extend the pipe line throughout the city from time to time as necessity may require."

Near the standpipe and between the 24 inch supply main from it to the high service district and the 12-inch supply main to the low service district from the storage reservoir it is proposed to erect a brick pump house 30 feet long and 15 feet wide in which it is proposed to install a 10,000,000 gallon centrifugal double suction single stage horizontal split gauge pump directly connected to an electric 250 horse power synchronous motor designed to operate against a head of 109 feet.

The suction pipe and the discharge pipe will be 18 inches in diameter, the 12-inch main from the reservoir is to be replaced by a 20-inch pipe with an 8-inch connection for drainage purposes to the nearby sink hole. This new 20-inch delivery main will lead into the pumping station and supply the pump. The 18-inch outlet from the pump will connect to the 24-inch main to the standpipe. The water from the reservoir will come to the pump under a head of from 10 to 18 feet.

This installation is proposed for emergency uses, to increase fire pressure in the high service district and to maintain this pressure from the rseervoir which assures one day's supply to the high service district during any temporary shut down at the main pumping station.

The quality of the water in the reservoir deteriorates owing to the growth of algae. In the brick lining there are many crevices, affording opportunity for the lodgement and growth of this vegetable organism. Treatment of the reservoir water with solutions of copper sulphate is not sufficient as a remedy. The germicide does not reach the organisms imbedded in the cracks and crevices. What should be done here is to fill up these places or lodgement with a cement or other grout, the object being to make a smooth surface throughout the bottom and sides of the reservoir. This has been observed at other places to be an effectual remedy for the frequent recurrence of algous growths.

The proposed sanitary dam is to be located 225 feet up-stream from the present intake at the Conestoga Creek pumping station and it is to serve as a new intake.

The dam is to be 187 feet long between wing walls, is to be of rubble concrete construction with crest at the same elevation as the Rancks Mill dam. It is to be built into the rock bed of the stream, will be 6.5 feet high and about 10 feet in width at the bottom and about 7 feet in thickness, 2.5 feet from the top. From the inner face 4 feet from the bottom it will slope upward 2 feet 6 inches in a horizontal length of 2 feet to the crest and then by a reverse curve it will have a gradual sloping outside face to the toe of the dam. This heavy section has been provided to facilitate the passage of driftwood and ice over the dam. At the crest spaces will be formed for the insertion of flash boards to raise the water level 7 feet higher during droughts if this should be found desirable.

Two 10-foot sluiceways have been provided in the dam one at each end. They are provided to empty the pool and they extend to bed rock. In them will be inserted stop logs, 8 by 8 inch timber resting one upon the other. Bolted rings are fitted in to admit of lifting the logs from place. When removed the sluiceways will provide additional space for the passage of water during floods. It is intended to carry the ordinary flow of the creek through one of these sluiceways over a weir. An automatic gauge for registering height of water will be installed.

It is proposed to use the wing walls as abutments for the support of a carriage bridge 10 feet wide with two spans, the inner ends to rest on a cement masonry pier midway of the dam. In the bottom of this pier is to be a 20-inch drain pipe with manhole and gate as an additional drainage facility. The city will lower Rancks dam so as to maintain the level of the pool below the proposed dam at about 3 feet less than the existing pool level. This will be substantially at the same elevation as the bottom of the big sewer and will prevent backflooding of it. Whatever changes at Rancks dam that it may be necessary to accomplish will be carried out by the city.

The bridge proposed is most desirable. It will provide easy access to and from the filter plant. Now there is no means of getting from the pumping station to the purification works except by boat unless trespass upon the railroad bridge is committed.

On the bank at the end of the dam nearest the pump house is to be built a new intake chamber provided with screens and covered over. From it a 42-inch cast iron pipe line will extend to the 9-foot masonry conduit at the pumping station. Between this connection and the creek bank a new brick wall and sluice gate is to be built across the conduit, thus doing away with the present intake, except for emergency purposes.

10. Conclusions.

The filter plant has added to the security of life and public health in Lancaster. Seventy-seven per cent. reduction on the average for five years corresponds with the percentage of reduction at Pittsburgh and Philadelphia and elsewhere through the introduction of filtered water to a community previously supplied with sewage polluted water.

From the facts hereinbefore given, it is evident that the filter plant is unequal to the task of filtering water at all times up to 9,000,000 gallons in 24 hours and producing a safe effluent. There have been a few days during the five years when the guaranteed standard of 97 per cent. removal of bacteria from raw creek water having 4,200 or more of the organisms in it has not been secured and there have been days of less bacterial content in the raw water when the effluent was not up to the standard. These times have been frequent enough to indicate a peril. It is known that after using a filtered water supply for a period of years, the general public is much more susceptible to water-borne infection than before. So that if unpurified polluted water is again delivered into the town, a rapid spread of the disease may follow from a little pollution. It is imperative that the filtered water shall be of a uniform high standard of purity.

The poor efficiency of the Lancaster filter plant at times, bearing in mind that the average water consumption in the city is about 6.5 million gallons daily, would likely be extended over all of the time were the average consumption to increase to 9,000,000 gallons, the normal rated capacity of the filter plant. There is need of the installation at once of a permanently constructed disinfecting plant available for use at a moment's notice under arrangements that will admit of easy regulation and control and the keeping of accurate records of the operation. Experiments should be conducted to determine whether immediate improvements in coagulation can be secured by the introduction of the chemicals at the pumping station; and to determine where best and in what quantities the germicide should be applied under the varying conditions obtaining at the plant.

Furthermore, a laboratory should be equipped on the grounds and the chemist should devote his entire time to the responsible direction of the operations at the purification works.

The suggestions relative to attention to loss of head gauges and to use of re-wash pipes and of care in cleaning the filters and putting them into operation again should be heeded by the proper authorities. The use of soda ash should be cut out as soon as practicable. Plans for additional subsidence capacity should be prepared and submitted for approval. This basin should be provided with two compartments to admit of the draining of one while the other is in commission. No raw water should be by-passed around the new sedimentation basin to the filters and no passing of scrubbed water to the clear water basin or main should be permitted except, possibly, in some great emergency, and not then unless it were treated with a germicide.

The proposed sanitary dam will carry out the provisions of the decree of the Commissioner of Health. The prompt action by the mayor in taking this matter up, in bringing about the temporary treatment of the water with a germicide and requesting the Department to make investigations should be appreciated. The Commissioner of Health must have the co-operation of local authorities in order to accomplish the greatest protection to public health.

All private well supplies in the city ought to be examined and be condemned if the physical surroundings or tests of the waters demand it.

The city should stop the practice of public bathing in the Conestoga Creek below the city sewers. It is to be regretted that beautiful streams of water that were pure a generation ago are now no longer safe for such healthful a pastime as swimming. Plans for sewage disposal works are to be submitted by the city to the State Department of Health for approval on or before July 1st, 1911.

The East End Reservoir needs improvements to promote circulation of the water. Any changes in the structure should be approved by the Department.

11. The Decree of the Commissioner of Health.

On August 7, 1911, the Commissioner of Health issued a decree approving the plans for the proposed dam, auxiliary pumping plant and extensions to the pipe system in the city, subject to the following conditions and stipulations:

FIRST: When the new intake is built, before additional storage is secured by means of the use of the flash boards, a plan of the pool thus to be formed and its storage shall be filed in the office of the State Department of Health.

SECOND: No raw water shall be admitted to the pumping station and be pumped into the town unless during some great emergency and not then unless the water be treated with a germicide with apparatus to be approved by the Commissioner of Health. The Commissioner of Health shall be notified, and the city health authorities, of any such occurrence and every precaution possible shall be taken by the city to protect the health of its inhabitants

THIRD: The city shall take up forthwith with the filtration company the matter of the several changes and improvements hereinbefore outlined with respect to the construction and operations at the filter plant and on or before eight weeks from the date of this permit the city shall submit to the Commissioner of Health a written report of the results of its negotiations which it shall have conducted meantime with said company for the carrying out of such changes and improvements. Detail plans of changes, before they are made, must be approved by the State Department of Health.

FOURTH: The city shall keep daily records of the operations at the pumping station and of the water works system on blank forms satisfactory to the State Department of Health and copies thereof shall be filed monthly in the said Department's office.

FIFTH: At the close of each season's work plans of the water pipes laid during the year shall be prepared and filed by the City in the office of the Commissioner of Health, together with any other information in connection therewith that may be required, to the end that the Department may know the extent of the water works system and the public use thereof.

SIXTH: If at any time in the opinion of the Department the water works system or any part thereof, or the water supplied thereby, is prejudicial to public health, then such remedial measures shall be forthwith adopted and enforced as the Commissioner of Health may advise or approve.

SEVENTH: The city shall file at the end of each week, with the State Department of Health a copy of the chemist's report to the city, of work performed by him in connection with the water works system and the filter plant.

It is the intention of the Department, if the city fails in its negotiations with the filter company for the suggested changes, to take the matter up directly. The Department will be glad to advise with both parties.

C. Hershey Water Supply Investigation.

The Department exercises its jurisdiction as far as practicable over the supplies of water drawn from private wells and springs in municipalities as well as in the townships as a part of its necessary work in protecting public health. The village of Hershey, Dauphin County, is an industrial settlement unincorporated, located in Derry Township. There is no local Board of Health to which the question of purity of individual water supplies may be submitted and hence, when it was discovered that some of the wells in the village were polluted and that in all probability all of them might be so polluted, the Commissioner of Health, in order to avoid a possible epidemic of typhoid fever, ordered a special investigation made. Assistant Engineer Emerson was detailed by the Chief Engineer to make an examination of the town to ascertain if it would be practicable to order the installation of a sewer system. The first investigation resulted in a negative report. However, the founders of the village agreed to give further consideration to the matter of building a sewer system and the subject will probably receive consideration during the ensuing year.

Assistant Engineer Irwin spent parts of two days in Hershey village relative to the closing up of the two springs in the picnic grounds. Assistant Engineer Roland B. Styer did all of the other investigating and work, among other things installed a calcium hypochlorite treatment plant at the public water works station. He prepared a report of the Department's operations which follows in full.

General Conditions.

The village of Hershey is located in Derry Township, Dauphin County, Penna. It is along the Lebanon Valley Branch of the Philadelphia and Reading Railroad and about thirteen miles from Harrisburg. It is connected by trolley with Harrisburg and Lebanon. The town lies on the south side of Spring Creek which rises about 4.5 miles to the southeast and empties into Swatara Creek about 1.5 miles west of the town.

The village of Hershey was started by Mr. M. S. Hershey when he moved his chocolate factory there from Lancaster, Pa. The first building was begun in 1902, and completed in 1905. Since that time building has continued from year to year until there are now sixteen acres of floor space in the factory and other buildings are under construction. In addition to the factory buildings there have been erected a large department store, Hershey Inn, Hershey Cafe, the Y. M. C. A. and bank building, school house, printing building, laundry, car barn and about ninety houses. The population is estimated at about 500.

The village of Derry is an old one and extends the length of about three-fourth of a mile. It is on the north side of Spring Creek. Since the installation of the factory about twenty new houses have been erected. The town at present consists of 93 houses. The population is estimated at about 500. This would make the combined population of the two villages about 1,000.

The chocolate factory employs about 1,400 persons, 400 of which are girls, the remainder men and boys. The inhabitants of the two villages are dependent upon the factory for support, there being no other industry in the vicinity. In addition to the villagers many persons are employed from Lebanon, Palmyra, Campbelitown and the surrounding districts on account of the trolley service to these sections.

A nine hole golf course and a country club has been constructed for the benefit of the employees. Mr. Hershey has also constructed a large park extending on both sides of Spring Creek west from the railroad culvert a distance of about three quarters of a mile covering an area of about 150 acres. The park has been put in excellent condition and contains deer pens, bear pits, bowling alleys, cafe, dancing pavilion, theatre, shooting gallery, photograph gallery, miniature trolley, athletic field, concrete swimming pool, boating pond and skating pond. During the summer months the park is used by thousand of persons. Large picnics from the surrounding towns, as well as from Harrisburg, Lancaster and Reading, are held on the grounds.

Disposal of Sewage.

The sewage of Hershey is mainly conducted to cesspools. The sewage from the chocolate factory is conducted to two large cesspools in the rear of the main buildings about 400 feet from Spring Creek. In addition to these there are four cesspools which might be termed public ones. One of these is located along the railroad tracks about 200 feet west of Cocoa Avenue. This cesspool receives sewage from the railroad station, the public school and the Y. M. C. A. and bank building. It is about 700 feet from Spring Creek. Another cesspool is located on the alley between Chocolate and Caracas Avenues, about 400 feet west of Cocoa Avenue. This cesspool is about 1,100 feet from Spring Creek and receives the sewage from Hershey store, Hershey Inn and seven private houses along Chocolate Avenue. Another cesspool is located along Java street about 600 feet south of Granada Avenue. This cesspool receives the sewage from the car barn, 17 private residences on Caracas Avenue and 11 private houses along Java Street and Chocolate Avenue. Another cesspool is located along Ceylon Street about 500 feet south of Granada Avenue. This cesspool has been built to receive the sewage of twenty houses on Avenue A which has just been completed. The two latter cesspools are south of the crest of the hill and the surface drainage at this point is away from Hershey. In addition to these there are twenty eight cesspools receiving sewage from 33 private residences, all of which are 500 feet or more from Spring Creek. The cesspool of the garage is about 200 feet, that of the printing building about 300 feet, that of the laundry 25 feet and that of the country club about 100 feet from Spring Creek. The pumping station has a privy. From this it is seen that practically the entire sewage of Hershey is conducted underground to cesspools which find ready outlets in the crevices of the limestone underlying the village. There is only one sewer pipe in the town. This is a 16 inch pipe extending from the chocolate factory to Spring Creek and emptying into this just above the railroad culvert. It is claimed that this carries chiefly the rinsing water from the milk cans.

In the village of Derry there are twenty-five houses which sewer into twenty-two cesspools. These are mostly the new houses which have been erected on Trinidad Avenue since the building of the factory. Most of the older houses use privies of which there are sixty-nine.

The sewage of the park is cared for by seven privies.

Private Water Supplies.

The water supply for the park was obtained from two large springs and the public supply.

One spring flows from beneath an old frame building located adjacent to the main highway connecting Hershey and Derry village and on the north side of

Spring Creek. The building was formerly used for general store purpose but at present is unoccupied. Stone steps lead down to the spring which was accessible immediately outside the building. The water came from beneath the building and the overflow followed near the highway to Spring Creek about 100 feet distant. Upon examination it was found the spring issued from beneath a lime stone rock upon which the front part of the building rested. The water beneath the building and the pool from which water was usually obtained, were so low that at time of high water Spring creek overflowed both.

The results of analyses of this water made at the Department's laboratories are as follows:

	Bacteria per c. c.	B. coli per c. c.
July 6th,	720	210
July 6th,	1,500	35
July 10th,	2,400	32
July 11th,	3,000	105

From the above results the spring was condemned, and on July 10th the pool was covered with heavy timber and the entrance beneath the building was securely closed. Frequent subsequent inspections showed that the spring water had not been used.

The other spring is located between the railroad bank and the creek near the trestle bridge crossing the creek. A wall has been built around the spring forming a semicircular basin about 8 feet wide, overflowing to the creek. This spring was largely used by picnickers for drinking. A part of the spring water was conducted by an 8 inch pipe to two distant points on the picnic ground where in each the water was accessible in a running stream from a 1 inch pipe connection to the 8 inch main.

These streams were placed within cupolas and made an attraction on the ground. The 8 inch pipe terminated in a swamp on the side of the creek opposite the boat house. At this point the water was often obtained for drinking purposes.

The following samples of water were taken by officers of the Department and analyzed at the laboratories:

	Bacteria per c. c.	B. coli per c. c.
July 6th, Spring,	300	24
July 6th, Spring,	130	8
July 10th, Spring,	210	12
July 10th, Spring,	600	10
July 10th, Tap in park,	140	8
July 10th, Tap in park,	480	12
July 11th, Spring,	320	1
July 11th, Spring,	700	12
July 12th, Spring,	210	12
July 12th, Spring,	140	12
July 19th, Spring,	350	24
July 20th, Spring,	840	18

On the basis of the above results the spring was condemned on July 10th. Mr. Hershey, under direction of an officer of this Department filled the basin of the spring with railroad ties and heavy timber so that water could not be obtained, plugged the 8 inch main at the spring and at the outlet in the swamp and had caps screwed on the 1 inch connections at the cupolas. A new pipe line was then laid from the public water main to the cupolas. It is not impossible however, for a person with a little inconvenience to obtain water from the spring.

In addition to these two springs, public water was obtainable at the park cafe, and three or four taps in the grounds. Thus after July 10th no water was supposed to be open for public use on the grounds except the public supply.

However, after the closing of these springs a small spring which had up to this time been unknown and which issued from the ground within five feet of the creek was dug out by workmen of the Philadelphia and Reading Railway to fill their water buckets. This spring was within 15 feet of the spring formerly used for the public supply and is supposed to be an outlet from that spring. Samples were taken from this spring as follows:

	Bacteria per c. c.	B. coli per c. c.
July 19th,	160	30
July 20th,	300	12

On the above results this spring was condemned and on July 27th, Mr. Hershey had the spring filled with rocks and earth. Since the closing of this spring it has not been known that any other source of supply other than the public supply exists in the park for the use of its patrons.

The water supply of Derry is composed of the Hershey public supply and private wells. About 30 houses in the village are connected to the public supply and there are 13 wells. Thus there are about 50 houses which obtain their water from neighboring wells or faucets. Samples were taken from each of the wells and analyzed at the Department's laboratories. The following is a brief description of the wells:

Well of Jacob Nissley: This is a dug well, 45 feet deep and 50 feet from the house. The well is covered with boards and is tight to exclude surface drainage. The privy is below the pump on the hill and about 100 feet distant. The privies of the houses on the opposite side of the road are about 125 feet from and slightly higher than the well, this well was treated with lime July 28th but showed little improvement.

	Bacteria per c. c.	B. coli per c. c.
July 19th,	100	8
August,	80	1
August 30th,	800	60

On the strength of these results Mr. Nissley was advised that the water was not a safe one for use and that the well should be closed or all the water boiled. In compliance with this advice the well has been permanently closed.

Well of Mrs. Harriet Fox: This is a drilled well, 35 feet deep and cased to the rock. It has a tight stone cover and is free from surface pollution. It is about 15 feet from the back of the house and 50 feet from the privy. This well is about 200 feet from that of Jacob Nissley and is slightly lower. It is about the same level and this in connection with a comparison of the bacteriological results obtained from the two wells would lead us to believe that this well may be fed from that of Mr. Nissley. The following results were obtained at the Department's laboratories:

	Bacteria per c. c.	B. coli per c. c.
July 19th,	210	18
August 1st,	70	1
August 30th,	720	36

In view of these results Mrs. Fox was advised that the water was not safe for use and should be closed or all water used from it should be boiled. We have been assured that all water used by Mrs. Fox is being boiled and that notice has been given by her to all other families using the water that this should be done.

Well of Henry Demuth: This is a dug well 35 feet deep with a tight cover and free from surface pollution. It is 100 feet from the privy and is used only by one family. The following sample of water was taken:

	Bacteria per c. c.	B. coli per c. c.
July 19th,	400	0

Well of John E. Hecker: This is a dug well 40 feet deep. It has only about 18 inches of water and is said to have a continual flow of water. The well is covered by two stone slabs which are not tight. There is no trough to convey the waste water and this can readily be washed into the well. The well is about 100 feet from the privy. The following sample of water was taken:

	Bacteria per c. c.	B. coli per c. c.
July 19th,	120	6

Mr. Hecker was advised that the water was suspicious, although the pollution shown by analyses might have come through the top, and that the well water should be boiled and another sample taken from it. Mr. Hecker did not care to have the well resampled. The well is used at times by other families.

Well of L. & M. Ginrich: This is a dug well 35 feet deep. It has a tight cover and is about 75 feet from the privy. The following sample was taken:

	Bacteria per c. c.	B. coli per c. c.
July 19th,	12	0

Well of Levi Zimmerman: This is a dug well 63 feet deep and about 100 feet from the privy. It is tightly covered. The following sample was taken:

	Bacteria per c. c.	B. coli per c. c.
August 1st,	160	0

Well of Mrs. Christian Ginrich: This is a drilled well 65 feet deep with a tight cover and casing to the rock. It is about 50 feet from the privy and the results of the analyses showed as follows:

	Bacteria per c. c.	B. coli per c. c.
August 1st,	1	0

Well of Mrs. Lydia Weltmer: This is a drilled well 70 feet deep with a tight cover and casing to the rock. The privy is about 50 feet distant and the result of the analyses showed as follows:

	Bacteria per c. c.	B. coli per c. c.
July 27th,	50	0

Well of Israel Moyer: This is a dug well about 35 feet deep with a tight top. It is about 60 feet distant from the stable and 100 feet distant from the cesspool. The results of analyses of this water showed as follows:

	Bacteria per c. c.	B. coli per c. c.
July 27th,	10	1
August 30th,	7,200	120

Mr. Moyer was advised that this water was not safe water for use and should be boiled or the well closed and the latter method was adopted.

Well of Mrs. Michael Moyer: This is a dug well for 23 feet and then drilled to a total depth of 50 feet. The top is tight and the well is 100 feet from the privy. The following result was obtained by analyses:

	Bacteria per c. c.	B. coli per c. c.
August 1st,	4	0

Well of A. E. Hershey: This is a drilled well 95 feet deep and cased to the rock. The well is located inside a grain mill and operated by a steam pump. It has a tight covering and is said to be a much softer water than the rest of the wells in this section. The following results were obtained by analyses of the water:

	Bacteria per c. c.	B. coli per c. c.
August 1st,	40	4
August 30th,	7,000	660

Mr. Hershey was notified that the water was unsafe for use and should be boiled or the well closed. He assures us that all water used for domestic purposes is being boiled but that the water is still used for mill purposes.

Well of Charles Wolf: This is a dug well 140 feet deep and about 125 feet from the privy. The cover is tight. The following sample was analyzed:

	Bacteria per c. c.	B. coli per c. c.
August 30th,	8,000	0

Well of Tobias Gehrel: This is a drilled well 98 feet deep and cased to the rock. It is tightly covered and about 75 feet from the privy. The folowing sample was obtained:

	Bacteria per c. c.	B. coli per c. c.
August 1st,	6	0

Hershey Public Supply.

There are no wells in the village of Hershey and the whole town is supplied by the public system. This as at first established derived its water from a spring between the railroad and Spring Creek about 500 feet west of the railroad culvert. It is at the bottom of the hill upon which the factory is built.

On March 10th, 1908, a permit was granted by the Commissioner of Health to obtain a new source of water. This source is a spring at the foot of the hill upon which the Hershey mansion is built. It issues forth out of a crevice in the limestone rock at a rate said to be 1,500,000 gallons per day.

The spring discharges into a storage basin, irregular in shape, about 400 feet long with a capacity of about 550,000 gallons. It is located between the bottom of the hill and a small run. A stone wall 5 feet high forms the sides of the reservoir.

The end of the reservoir is about 40 feet wide with an overflow 4 feet wide and 3 feet deep. The overflow empties into a second basin before flowing into Spring Creek.

A 16 inch pipe extends from the reservoir to the suction well a distance of 400 feet. This well is located just outside the pumping station and is built of concrete 14 feet deep, 9 feet in diameter with a peaked board roof. The height of the water in the well is about 9 feet above the bottom.

The pumping station is located about 50 feet from Spring Creek, at a point where the Philadelphia and Reading Railway crosses. There are two electric, duplex, vertical single action pumps of 150,000 gallons capacity each, and a horizontal duplex steam pump 1,500,000 gallons capacity.

The water is pumped through either of two six inch mains to the town, the excess of water being forced into an iron tank four hundred and fifty feet from the pumping station on the hill in the rear of the factory. This tank is 18 feet in diameter and 27 feet deep and has a capacity of 50,000 gallons. The mains consist of 6 and 4 inch pipes of which there are about 1½ and 2½ miles respectively.

The daily consumption in summer is about 800,000 gallons and in winter about 675,000 gallons, the difference of consumption being due to the extensive use on lawns and in gardening. Only about 25 per cent. of the amount is used for domestic purposes.

The following samples of water were collected by officers of the Department and analyzed at its laboratories:

Location.	Bacteria per c. c.	B. Coli per c. c.
July 6th, Tap,	60	0
July 6th, Tap,	1000	0
July 10th, Tap Park House,	4	0
July 11th, Spring,	80	1
July 11th, Tap Park House,	4	0
July 11th, Tap Park House,	10	0
July 12th, Spring,	10	0
July 12th, Spring,	4	0
July 12th, Tap Park House,	6	0
July 19th, Spring,	1	0
July 19th, Spring,	80	2
July 19th, Tap at cupola,	700	0
July 19th, Tap at Park House,	16	0
July 20th, Spring,	40	0
July 20th, Spring,	100	2
July 20th, Tap at cupola,	1000	0
July 20th, Tap at Park House,	4	0
July 27th, Spring,	6	1
July 27th, Spring,	12	0
July 27th, Tap Park House,	8	0
August 1st, Spring,	30	1
August 1st, Tap at cupola,	210	0
August 1st, Tap Park House,	12	0
August 30th, Spring,	420	36
August 30th, Spring,	320	21
August 30th, Tap Park House,	240	12
August 30th, Tap Park House,	460	24
August 30th, Tap Ice House,	360	30
October 31st, Spring,	720	0
October 31st, Spring,	100	1
October 31st, Tap Printer Building,	800	0
October 31st, Tap Hershey Store,	20	0
October 31st, Tap Pumping Station,	12	0
November 2nd, Spring,	70	1
November 2nd, Spring,	120	0
November 2nd, Tap Pumping Station,	4	0
November 2nd, Tap Laundry,	4	0
November 2nd, Tap Residence Mrs. Hunter,	8	0
November 2nd, Tap Hershey Store,	2	0
November 9th, Spring,	100	1
November 9th, Spring,	84	0
November 9th, Tap Haefners Hotel,	4	0
November 9th, Tap Pumping Station,	10	0
November 9th, Tap Hershey Store,	12	0
November 9th, Tap Laundry,	6	0
December 5th, Spring,	16	0
December 5th, Spring,	18	0
December 5th, Tap Pumping station,	4	0
December 5th, Tap factory engine room,	20	0
December 5th, Tap Hershey Store,	4	0
December 5th, Tap Laundry,	3	0

Of twenty samples taken from the spring ten showed the presence of B. coli. During the four or five days preceding August 30th rain fell almost continually.

As a result of these analyses Mr. Hershey was advised by the Department that a chloride of lime disinfection apparatus should be installed for temporary use and that steps should be taken to obtain a better source of supply.

Acting upon this advise the chloride of lime apparatus was installed in the pumping station and put in operation September 15th, 1911. The apparatus consists of two barrels, one for mixing and one for feeding the solution. The solution is fed through a ¾ inch pipe under ground to the suction well, one pound of lime is dissolved in 30 inches of water and the number of inches fed is regulated to the amount of water being pumped. At first about one-tenth of a grain of chloride of lime to the gallon of water was added and on November 1st the amount of chloride was reduced to about four hundredths of a grain to the gallon. The following table shows the operation of the plant from its installation to December 17th.

Date.	Gallons Pumped.	Pounds of Lime Used.	Grains per Gallon.
September 16th,	855,096	14	.115
September 17th,	635,760	10	.110
September 18th,	802,100	13	.113
September 19th,	831,472	12	.101
September 20th,	838,170	13	.108
September 21st,	838,404	12	.102
September 22nd,	821,498	12	.122
September 23rd,	791,105	11	.098
September 24th,	666,693	9	.095
September 25th,	818,636	12	.102
September 26th,	815,106	13	.111
September 27th,	846,857	12	.099
September 28th,	868,958	13	.105
September 29th,	829,606	12	.101
September 30th.,	852,965	11	.090
October 1st,	552,277	10	.127
October 2nd,	895,329	13	.102
October 3rd,	907.360	13	.100
October 4th,	850,016	13	.107
October 5th,	871,981	13	.104
October 6th,	827,483	13	.109
October 7th,	828,409	13	.109
October 8th,	651,404	10	.108
October 9th,	810,615	12	.103
October 10th,	766,721	12	.109
October 11th,	775,372	13	.117
October 12th,	932,287	13	.098
October 13th,	789,229	13	.115
October 14th,	701,615	11	.109
October 15th,	497,080	11	.124
October 16th,	768,831	13	.119
October 17th,	771,409	13	.118
October 18th,	820,116	13	.111
October 19th,	795,696	13	.114
October 20th,	789,822	13	.115
October 21st,	733,095	11	.105
October 22nd,	613,829	10	.110
October 23rd,	780,159	13	.116
October 24th,	772,916	12	.109
October 25th,	740,832	12	.113
October 26th,	709,439	12	.118
October 27th,	707,205	12	.118
October 28th,	707,205	11	.109
October 29th,	611,139	11	.126
October 30th,	802,162	13	.113
October 31st,	771,978	11	.099
November 1st,	724,247	4.25	.041
November 2nd,	692,669	4.25	.044
November 3rd,	754,134	4.50	.042
November 4th,	503,201	4.25	.059
November 5th,	530,077	4.	.053
November 6th,	692,286	4.25	.043
November 7th,	694,211	4.25	.043
November 8th,	705,639	4.25	.042
November 9th,	702,516	4.25	.042
November 10th,	680,576	4.25	.043
November 11th,	597,763	4.	.049
November 12th,	523,154	4.	.053
November 13th,	647,085	4.	.043
November 14th,	618,851	4.	.045
November 15th,	654,574	4.	.043
November 16th,	592,187	4.	.047
November 17th,	544,700	4.	.051
November 18th,	580,745	4.	.048
November 19th,	561,655	4.	.049
November 20th,	589,605	4.	.047
November 21st,	571,860	4.	.049
November 22nd,	724,256	4.	.039
November 23rd,	650,059	4.25	.046
November 24th,	632,598	4.	.044
November 25th,	558,089	4.	.050

Date.	Gallons Pumped.	Pounds of Lime Used.	Grains per Gallon.
November 26th,	513,196	3.25	.044
November 27th,	635,265	4.25	.047
November 28th,	720,039	4.25	.041
November 29th,	727,320	4.	.039
November 30th,	545,477	3.25	.042
December 1st,	656,328	4.	.043
December 2nd,	594,467	3.75	.045
December 3rd,	608,744	3.50	.040
December 4th,	702,405	4.25	.042
December 5th,	697,037	4.25	.043
December 6th,	750,704	4.50	.042
December 7th,	618,558	4.25	.048
December 8th,	731,034	4.25	.041
December 9th,	697,210	4.00	.043
December 10th,	625,564	4.00	.045
December 11th,	729,541	4.25	.041
December 12th,	735,427	4.25	.040
December 13th,	720,113	4.25	.041
December 14th,	694,065	4.25	.043
December 15th,	819,228	4.50	.038
December 16th,	670,432	4.25	.044
December 17th,	602,491	3.75	.043

Mr. Hershey is at present considering a proposition to change his source of supply. It is realized by him that in the near future the present source will be insufficient to supply the demand as the chocolate plant is being continually enlarged, and the population of the district increased. It is expected that this change will be made in the coming summer. The three propositions under consideration at present are the filtration of Spring Creek, the filtration of Swatara Creek and the drilling of wells in the sandstone hills of the village. Wells are now being drilled to ascertain the feasibility of the last proposition.

Discussion.

The question of the source of pollution of the various water supplies in this district is an interesting one. It raises the point as to whether the source is a common one to all the waters found polluted or whether each has a separate source of contamination and also whether the pollution is of local origin or not.

The rock underlying Hershey and Derry is a limestone stratum and forms the foundation of the Lebanon Valley. This valley is of a somewhat triangular shape with Hershey lying almost at the apex of the triangle. At this point the valley is about 2½ miles wide. On either side of the valley are the sandstone hills. The large size of the springs in this community prove that they are not of local origin alone, but must be the drainage of a large area. On the other hand the immediate increase of water after a rain would seem to indicate that at least a part of the water comes from a territory not far away. It is probable that the water from some distance finds its way down the hills on either side and issue forth in this community. In this case the pollution might be from some distant source.

The depths of the various wells and springs are close enough to seem to show at least a certain water level for this section. The eastern end of Derry is within a few hundred yards of the northern sandstone formation. The wells of A. E. Hershey and Israel Moyer are in this section of the town and some distance from Hershey. The water of the former well is somewhat softer than the other wells examined and the whole formation would point to the fact that the pollution of this well does not come from Hershey cesspools at least not directly.

On the other hand at all times the springs in the park showed higher pollution than the other waters in this section and their proximity to the factory cesspools would seem to justify the assumption that these cesspools were in part the cause of the pollution of these springs. On only one day did the Hershey public supply show high pollution and this followed continued hard rains. Here also the proximity of the cesspool at Hershey mansion would tend to throw suspicion on this as a probable cause of the pollution. Had the source of pollution been the same for all the waters in this section it seems the public spring would have borne a pollution relative to the others.

On the whole the theory that the pollution of these waters is from cesspools in the vicinity of Hershey seems to be the most tenable. It however seems important that the treatment of the water with chloride of lime should be continued permanently until another source of supply be acquired.

D.—MT. GRETNA MILITARY ENCAMPMENT.

Water Supply Investigation.

Special work was done during the summer at the Mt. Gretna Military Encampment relative to the investigation of the water supply.

Between June 29, and August 17, 1911, 354 samples of water and ice were collected from various public and private sources, and analyzed at the Department laboratories. The work covered the military reservation, picnic grounds, camp meeting, Chautauqua grounds as well as a portion of the surrounding country used as manoeuver grounds in connection with the National Guard encampment. This work was immediately undertaken upon receipt of the following communication.

"June 27, 1911.

"Hon. Samuel G. Dixon,
"Comissioner of Health,
"Harrisburg, Pa.

"Sir:—

"In former years, in connection with the encampments of the National Guard of Pennsylvania, held at Mount Gretna, Lebanon County, and Gettysburg, Adams County, I have communicated with the Department of Health, and the Commissioner has very kindly and courteously had examination and test made of the water supply.

"If consistent with the rules of the Department, I would request that an examination and test be made of the water at Mount Gretna, and vicinity, report to be made thereon, with suggestions and recommendations from the Honorable Commissioner of Health.

"The encampments at Mount Gretna, will be as follows:
4th Brigade, from July 8th to 15th, inclusive.
1st Brigade, from July 2nd to 29th, inclusive.

"It will be observed that a week intervenes between the closing of the one Brigade Encampment and the opening of the other.

"I beg to say in this connection that Major Rausch, the Quartermaster of the 4th Brigade, will be at Mount Gretna all the week beginning July 3rd, next.

"Very respectfully,
"Thos. J. Stewart,
"The Adjutant General."

Subsequently upon a verbal request from Major Rausch, July 4th, 1911, the investigation was extended to include the manoeuver grounds and the placarding of dangerous water supplies. At the close of the regular encampment, rifle practice was held, and the inspection of the water was, therefore, continued to August 17th.

The general conditions at Mt. Gretna have been described in detail in reports heretofore made covering similar investigations during encampments in 1907 and 1909. The general public supply to the military reservation and the Hotel Conewago had been materially improved in 1909 by substituting a drilled well supply for the stream and pond formerly used and which had been condemned. This improved supply was available and used during 1911. Excluding the manoeuver grounds samples of water were taken from 48 different sources, and 2 samples of ice used by the militia. Three hundred and twenty-three samples were collected, the number varying from one to 29 from each source. Following the result of the analyses of these samples six springs and the pond north of the railroad tracks formerly used to supply the parade ground, were placarded with warning notices, the military authorities and the management of the resort immediately notified and the sources either protected by improving the surrounding conditions or their use effectually prevented. In some instances walled open springs were covered over, and protected from surface pollution and hand pumps installed. In two cases the changes produced an immediate improvement in the quality of the water. The total bacterial count was materially reduced and no B. Coli found in any subsequent samples.

Manoeuvering Grounds.

An inspection was made from July 6th to July 9th, preceding the manoeuvers, of the waters available and likely to be used for drinking purposes by the guardsmen throughout the territory within and adjoining the boundaries of the manoeuvering grounds which extended over a large area surrounding the encampment grounds. Seventeen wells, springs and points along running streams where inspection clearly indicated possibility of pollution, were placarded with warning notices. In addition to this, samples were taken of 31 available sources of drinking water, which were likely to be used. Seventeen of these were found, upon analysis, to show the presence of B. Coli, and were promptly placarded with warning notices. These were wells, springs and small streams regularly used for the most part by the farmers, and the owners and users of these were also warned of their polluted condition.

The various owners and interests concerned at Mt. Gretna actively co-operated with the Department in its work and the military authorities gave all possible assistance. No cases of sickness among the guardsmen due to drinking polluted water at Mt. Gretna have come to the attention of the Department, and it is believed that there were none.

E—WESTERN PENITENTIARY WATER WORKS REPORT.

The Western Penitentiary of Pennsylvania was first erected on public land adjoining the town of Allegheny in 1818. In 1878, new buildings were erected in Allegheny City. Up to January first, 1911, the cost of buildings had amounted to over one and a half million dollars. By Act of March 30, 1911, the Board of Inspectors was authorized to select a tract of land in the western part of the State in a rural district, so that the prisoners may be provided with useful employment in tilling the soil, and to construct thereon suitable buildings for a new western penitentiary, the cost not to exceed $1,250,000 dollars. An appropriation of $300,000 was made to commence the work. About 5,000 acres of land have been acquired lying largely in Benner Township, Centre County. The tract is about 4 miles from Bellefonte and 7 miles from State College. It extends from Nittany Mountain on the south northwardly and about five miles to beyond Spring Creek. The government of the Institution is vested in a board of five inspectors, all residents of Allegheny County, appointed by the Governor. They are as follows; all of Pittsburgh:

President, Charles A. Rook,
Secretary, Thomas A. Dunn,
Treasurer, William Price,
William E. Sankey,
Warden, John Francies.

In the fall of 1911, Warden John Francis asked the Commissioner of Health to advise relative to the proposed water supply for the new institution. Assistant Engineer Hooker made a field investigation, and after reporting to the Commissioner, he was finally instructed to and he did send the following letter:

"Harrisburg, Pa., December 7, 1911.

"Hon. John Francies,
"Warden, Western Penitentiary.

"Dear Sir:—

"I have made a careful study of the available water supplies for the two tracts in Centre County proposed as sites for the new Penitentiary and have prepared the following report which has been submitted to Dr. Dixon and approved by him. He requested me to say that if there was any further information which you wish regarding either of these two tracts or any other locations, he will gladly give the matter further consideration.

Report.

"Two tentative sites for the new Western Penitentiary are located in Centre County. One of these along Spring Creek in the Nittany Valley is so located as to indicate the desirability of using for domestic purposes the waters of a run flowing from McBride Gap. The other site is so situated in Penn Valley that Sinking Creek appears to be the only available source of an adequate water supply.

McBride Gap Supply.

"McBride Gap is situated 5 miles nearly due south from the borough of Bellefonte in Centre County and forms a cleft in Nittany Mountain. This mountain has an elongated depression at the top extending about 2½ miles southwesterly from the gap and about 1½ miles northeasterly, this mountain valley being less than a mile wide. Both portions are drained by small streams, the two uniting at Indian Rock and flowing about three-quarters of a mile through and emerging from the gap then disappearing in a sink hole. The watershed of the west branch lies almost entirely within a State Forestry Reservation, which extends nearly to the gap, and is uninhabited and entirely wooded. The east branch in its lower portion is steep and well wooded, while the upland section is open cultivated country with 6 occupied properties. On these estates there are upwards of 30 persons, 8 horses, 20 cattle and 20 swine. One-half mile below the junction of the two streams there are 2 or 3 houses, these being below any probable location for an intake.

"It is said to be the intention, should the Nittany Valley site be adopted, to obtain possession of the entire watershed of McBride Gap Run, giving the authorities complete control of the sanitary condition of the drainage area. A little used public road passes over the mountain through McBride Gap and a branch wood road extends in each direction through the watersheds. Bacteriological analyses of samples of water from McBride Gap Run made recently by the Department show the following results:

	Bacteria per c. c.	B. Coli per c. c
Main stream,	8	0
East Branch,	6	0
West Branch,	2	0

"It is understood that preliminary studies of the quantity of water available indicate the desirability of supplementing the McBride Gap supply by the use of water from Spring Creek for some purposes. The Spring Creek watershed above the proposed Penitentiary site is under a high degree of cultivation with a large population including a number of towns. A sample of water taken recently at the site at a comparatively high stage showed, upon analysis at the Department laboratories, a total of 70 bacteria per c. c. and no B. Coli. A chemical analysis of the water taken at the same time and place showed, upon analysis, the following results:

	Parts per million
Total solids,	180
Fixed solids,	98
Nitrogen as nitrites,	negligible
Nitrogen as nitrates,	2.67
Chlorine,	2.2
Free ammonia,	0.093
Albuminoid ammonia,	0.337

SINKING CREEK SUPPLY.

"Sinking Creek rises in a large swamp, known as Bear Meadows in an isolated thickly wooded State Forestry Reserve tract in the extreme southern part of Centre County in Harris township and flows in a northeasterly direction for about 30 miles, being the principal branch of Penn Creek, a tributary of the west branch of the Susquehanna River. The Penn Valley site tentatively proposed for the Penitentiary extends along Sinking Creek to the boundary of the State Forestry Reservation. This stream so it is reported is the only available adequate source of supply for this tract and the adoption of this site would involve the use of Sinking Creek water for all purposes.

"Bear Meadows is a tangled morass of nearly stagnant pools filled with decayed vegetation and the water has at all times a pronounced color characteristic of swamp waters. At low periods it is said that the water is heavily laden with suspended vegetable matters and has a dark color and unpleasant odor. Such a water should not be satisfactory for domestic purposes, except after treatment in filtration works especially designed to meet these conditions. Even then, with the utmost care in operation of the plant, it is probable that at times the water would have some color and an objectionable odor.

Conclusions.

"The McBride Gap supply could be easily rendered safe for human consumption Before the water of the east branch or of the main stream, however, could be safely used without filtration for domestic purposes, it would be necessary to acquire complete control of the drainage area and then maintain a careful watch to prevent access by hunters or others and regularly patrol the highway. It would be advisable to remove all farm buildings. On the west branch little need be done beyond acquiring property not now belonging to the State Forestry Reserve and maintain a careful sanitary patrol. Should the Spring Creek water be used as an auxiliary source of supply, the utmost care should be given to necessity of maintaining a complete separation of the two water supplies. Entirely separate systems should be used with no connection between them. Moreover, there should be no point at which the raw Spring Creek water could be used for drinking or culinary purposes, as this water could be made safe for human conusmption only after careful treatment in a modern purification plant.

"To render the Sinking Creek supply safe for human consumption it would be necessary to install a modern filtration plant and exercise special care in its operation."

Following out the advice in this letter Mr. Francies for the Commonwealth proceeded to acquire practically all of the land on the watershed not previously acquired by the State Forestry Department. These purchases embrace 22 parcels of land and a total acreage of 914 acres, all lying above the present water works intake. On the area so acquired above the water works there are 8 occupied estates and two vacant dwellings.

Immediately above the said intake on land not acquired by the Commonwealth but owned by Green Heaton there are two farms, one of which is vacant, the drainage from both of which reaches the stream supplying the penitentiary.

McBride's Run is formed up in the mountain south of the gap by two branches. The east one having on its drainage area two vacant properties and six occupied properties, the western branch draining an uninhabited tract. From this junction the waters tumble down over a steep narrow and rocky channel, sometimes almost disappearing under the stones and rocks and emerging from the gap pass out into the plain of the Nittany Valley where there are 4 dwellings, two being those on the Heaton farm and the others (Noll and Stover places) being on State property. Fifteen hundred feet down stream below this group of houses the waters of the run disappear below the surface of the ground during ordinary weather conditions. On the day of my inspection of the intake, I found a small stream of water flowing in a channel west of two other parallel channels, each separated by several rods. In the two easterly channels no water was flowing, it having disappeared underground. Evidently during wet weather when the mountainous torrents come from the gap out on the plain, the channels below the said intake are flooded and the water runs off toward the bottom of the valley along which the Lewisburg and Bellefonte branch of the Pennsylvania Railroad extends, but before reaching this lowest point, all signs of a stream channel disappear. The channel terminates suddenly in a great hole. It is reported that the yield from the mountain watershed has never been greater than the capacity of this sink hole to receive and care for the water. The formation is limestone and there are large subterranean channels. It is supposed that the waters appear at the surface again near Pleasant Gap which is 2 miles northerly where there is a flowing stream, never dry, known as Logan Branch of Spring Creek.

The intake is a wooden box about 6 feet long and 12 inches square, open on top, laid in the bed of the run into which is inserted a 3 inch iron pipe, perforated. It is elevated in the neighborhood of 150 feet above the railroad and the farm buildings of I. J. Dreese now owned by the Commonwealth, for which buildings the intake and pipe line was constructed a number of years ago and came into possession of the penitentiary at the time the Dreese farm was purchased. The pipe line terminates in the yard between the house and barn at a trough. The arrangement of the pipe is in the form of an inverted U, the water flowing constantly from the short arm. About half a mile to the north is the new penitentiary building where about 23 prisoners are now housed and where construction operations are in progress. All water is hauled here in tank wagons from the pipe line described.

In the fields above the intake box, cattle and swine roam about and sometimes wade in the water. At the Heaton farm there is a pollution of the stream at the barn-yard and pig-pen. At the Noll property there is also a barn-yard and possible privy pollution, also at the Stover house.

Proposed Improvements.

Mr. Francies reports that he will extend the pipe line from its present terminus to a point up stream above the four houses mentioned, where a new intake will be established. The pipe is to be purchased at once and the line is to be laid as quickly as possible, thus the water supplied to the institution will be free from contamination coming from the Noll, Stover and Heaton properties. Meantime, the Department will issue orders for the immediate abatement of the stream pollutions.

It is reported that the families of Noll and Heaton use the raw creek water. There is a little dam and a drinking cup provided there at the creek above these sources of contamination. Any polluting material getting into the water above this point would come from the pasturage in the fields adjacent to the creek and from the dwellings and farms on the east branch high up in the mountain. There is a roadway passing through the gap and over the mountain to Oak Hall, Linden Hall and Taylor Hall but the same is practically impassable for public travel. It is little more than a trail for pedestrians. The persons living in the said occupied houses on the mountain table-land passed back and forth from the mountain by way of the highway at Pleasant Gap to the east.

The last house towards Pleasant Gap on McBride's Run watershed is occupied by the family of Anthony W. Garber, consisting of Mr. and Mrs. Garber and an 18 year old son.

Typhoid Fever.

Mr. Garber is a stationary engineer employed in Pittsburgh at a brick works. He was taken ill September so it is reported, but kept up and about his work until October 2nd when he came home. His property which consists of 16 acres on which there is a dwelling, a barn and smaller buildings is now owned by the Commonwealth. On October 2nd, Dr. George L. Lee of Centre Hall was called in, diagnosed the case as typhoid fever, gave the necessary instructions and has called regularly since. The house which is said to be in Potter Township was placarded by Health Officer, G. M. Cooney, R. D. 54, Spring Mills. The patient is in the fifth week of the course of the disease, is sitting up and on the high road to recovery. The dejecta had been sterilized and buried in the garden, six rods from the house. The privy is 125 feet in the opposite direction and near the barn. The cow has been sold. It is the intention of Mr. Garber to vacate the premises this fall. The drinking water is obtained from a drilled well in front of the house. A sample of the water was collected on October 18th, and shipped to the Department laboratories. The milk used on the property is purchased from Mr. Thomas, the nearest neighbor whose farm house is a quarter of a mile distant. There is no channel for surface drainage anywhere near the Garber property. The slope of the ground is near the Thomas house where there is a spring at the edge of a swale. Mrs. Garber or the son take their own milk pail to the Thomas farm, have it filled and then return home, there being no interchange of vessels of contact. It appears to be improbable that the run waters have been polluted with typhoid infection. Mr. Garber ought not come in contact with his neighbors during the convalescent period, the existing privy vault which is full should be cleaned out, the material disinfected and buried, the hole should be disinfected and filled up with earth and a new earth vault should be dug and be used until the premises are vacated. The barnyard should be cleaned up and since the place must be handed over to the Commonwealth next April, Mr. Garber should be instructed to vacate before cold weather. Orders for these changes have been issued and will be watched by Inspector Haines. If typhoid should develop in the Thomas family, there would be danger of spring water being contaminated and probably the supply at the penitentiary in consequence. Mr. Thomas was furnished with a Department Typhoid Fever circular so that he might be informed of the nature of Typhoid Fever and the methods to be pursued in handling a case.

The George Thomas farm consists of 147 acres. On it is a house and barn and various other buildings. In front of the dwelling and at the edge of the lane leading to the barn is a house built over a spring which forms the headwaters of the run. Milk cans, a separator and other utensils are kept in the spring house. All of the water used in the dwelling or for any purposes comes from this spring. It has to be dipped up. There is a board platform an inch or so above the water in the spring. The water flows out from the spring into a little pool beyond where cattle can wade and where they drink. Anyone coming from the house to the spring is likely to pick up polluting material by means of footwear, and some of it is likely to be dropped off into the spring at the platform. The arrangement is entirely unsanitary and the custom of the family renders it a dangerous place in event of typhoid breaking out.

The privy vault is full and overflowing. The barn yard should be cleaned up and plenty of lime should be distributed about. The Thomas family is large. They intend to vacate the premises this fall. The privy should be cleaned and the material should be disinfected and buried and a new hole should be dug. The contact between the Thomas and Garber families should be prohibited and Mr. Thomas should be requested to vacate at an early date. Cattle and sheep are pastured in the field adjoining the spring. After rains the water in the spring become roily, establishing a good connection between the surface and ground waters. During droughts the waters become so low at the spring-house that recourse has to be had to another spring in the swale nearby. Five hundred feet down stream is the 2 acre lot of John Aungstaudt where he resides in a cabin on the brow of a slope at the foot of which is a copious spring that feeds the run. The cattle belonging to Thomas, graze in this field. Sheep were standing near by on the day of the Department's inspection and they might wade in the water. There is no privy on the Aungstaudt lot. Nuisances are permitted and the rains may wash some of the material into the run. The owner lives alone. He should be compelled to vacate immediately.

The next house along the run is on the property formerly of John Houser. This farm comprised 257 acres. Along the run at the foot of a lane leading to the public highway, several hundred feet distant, there is a barn, pig-pen, dwelling, privy, spring-house, chicken coops and minor buildings. The barn is 20 feet distant only from the run and the house about 50 feet Mr. Francies reports that it is the intention of the Board of Inspectors to tear down and remove most of the buildings and Mr. Francies is engaged in this work at the dwelling. The barn will be left standing. There is a wet weather spring that outcrops in the upstream corner of the ground floor of the barn. It runs along by the wall, keeps the ground saturated and helps make a nuisance. This spring is to be given a free outlet through a pipe line to the run. Then the stalls and manure are to be removed, lime is to be used as a disinfectant and after everything has been put in a sanitary condition, the barn will be used for storage purposes only. The pig-pen and house over it are in a very filthy condition. The house will be torn down and the wood burned. The manure will be carted away and disposed of in a sanitary manner. The privy is a loose vault and in wet weather it is likely to prove a pollution to the run. The superstructure is to be torn down, the vault is to be removed, the material disinfected and buried. Two small hen-coops or houses are in a filfty condition. They are to be destroyed by fire. Thus all possible sources of contamination will be done away with.

To the north on the hill, where there is considerable level ground, distant 1,600 feet from the run and elevated 200 feet higher, is a group of farm buildings on the Houser property tenanted by William Houser. There is a possible wet weather pollution from the privy vault. But it is rather remote. A natural wash of the ground would be down through an orchard and a dry run to the main stream. Attention to the proper care of the privy vault should render the Houser property quite safe. William Houser and his family of five would be greatly inconvenienced by having to move this fall. They have no place in view, but they expect to move in the spring.

Following up the lane to the main highway to the south of the east branch there are three dwellings. One of them is unoccupied. It has been vacant for four years. Formerly Dan Callahan owned the place. On the opposite side of the road is the house and barn of James. Callahan who has six in the family. Adjoining the barn is the pig-pen. There is a privy here also. Surface water can flow under the privy and remove some of the material to a ditch in the roadside, which eventually goes to a swamp area, the overflow of which reaches the main stream. Adjoining James Callahan's place is the Archibald Moyer property. There are ten of the Moyer family. At one end of the barn there is a pig-pen and privy. The vault is full and overflowing and in a wretched condition but there is not much danger of stream pollution from this estate. These last two families do not wish to move until compelled by the State.

Beyond this, McBride s Run traverses wild wooded territory until it comes to the group of four houses hereinbefore described.

Thus it is seen that Mr. Francies is already at work tearing down the buildings at the most dangerous property along the east branch and that three of the occupied properties will be vacated this fall, since Mr. Aungstaudt has expressed it to be his intention to move away as soon as orderd. However, if Typhoid Fever should break out in the homes of the three remaining families, danger of contamination of the run water would exist, the extent depending upon the acts of the individuals. Furthermore, agricultural pursuits are attended with more or less pollution of surface waters.

Mr. Francies was advised to boil for 20 minutes all water used at the institution for culinary purposes or for drinking. Orders for putting the occupied properties in a sanitary condition were issued verbally on the occupants and these were followed by written orders. Dr. Lee was requested to see to it that extra precautions be taken at the Garber house.

Request for Advice.

Mr. Francies requests written advice and recommendations from the Commissioner of Health with respect to conserving the purity of the water of McBride's Run as a source of supply to the institution.

The Board of Inspectors have in mind to maintain some of the buildings on the watershed, if this will not be a menace to the purity of the stream.

Probably over $30,000 has been expended to acquire the properties comprising the drainage area. This expenditure was made upon the advice of the State Department of Health that the ownership of the watershed should vest in the State. A filter plant could have been built for this sum of money. Ultimately 1.500 persons may be located at the penitentiary. A daily consumption of half a million gallons may be reached. During the dryest weather the stream yields more than double this amount, so it is reported. There is a site on the west branch of the run where a storage reservoir could be constructed for a reasonable expenditure of money, but at best the dam would cost a good deal. On the east branch it is extremely doubtful if a reservoir of sufficient size could be built, and below the forks the grade of the run is so steep that it would be impracticable to obtain adequate storage. The cheapest and best plan is to utilize the flowing water of the run, conducting it to a gravity main by means of a small diverting dam, at least for the early years of the institution. By abandoning the use of the land for agricultural purposes, and by restoring the drainage area to its primitive condition of forest, soil washing will be obviated, sediment will not appear in the stream to any appreciable extent and a pure mountain water will be available. If farming operations are continued, there will be periods of turbid water and probably filtration would have to be resorted to, to afforded a clear sparkling water at all times. The land was purchased in the first place to conserve the purity of the waters and the best use to which the land can be put is in following out this original purpose. A pure mountain spring water is most desirable and it should prove a very great asset to this State institution. If land high up on the mountains is wanted for cultivation of fruit or other farm products, then land for this specific purpose had best be purchased off the watershed.

Recommendations.

I respectfully suggest for your consideration that you advise the Board of Inspectors, Mr. John Frances, Warden. and Superintendent of Construction, that the purity of the waters of McBride's Run can be best conserved in the interests o public health by removing from the watershed all dwellings and places of abode of human beings and animals and of restoring the area to its original condition of forest land at the earliest practicable date and in pursuance of this purpose that John Aungstaudt be required to vacate the premises occupied by him at once; that Mr. Garber be requested to vacate his premises this fall, the exact time depending upon the state of his health and the convenience of the members of his household and that a similar request be made to George P. Thomas. William Houser and Messrs. Callahan and Moyer need not vacate till next spring; but the families of these three men should be kept under observation and prompt notice should be given to the State Department of Health of the occurrence in these families of any contagious or infectious disease. And furthermore, such changes and improvements as will be orderd by the Commissioner of Health shall be carried out if not by the occupants then by the Board of Inspectors since litigation will not accomplish the result required.

It is understood that the present intake is to be relocated higher up on the stream above the four properties hereinbefore described.

Meantime, all water used for domestic purposes at the penitentiary should be boiled.

IV. FIELD INSPECTION.

There are three distinct kinds of work performed by the sanitary inspectors.

The first is a detailed work of stream preservation and is on the upland watersheds sparsely populated and of a small area, where inspection and patrol can easily prevent the waters of the State from being polluted, except by accident.

The second is the less particular work on large watersheds whereon may be located villages, towns and cities, the drainage of which goes into a stream subsequently used as a source of public water supply. The refinements in sanitation readily accepted as practicable for the upland watersheds would be impracticable if enforced on these lower watersheds. In the latter instance two safe-guards are necessary; the diminution of sewage pollution as far as practicable, and the filtration of the water supply.

The third kind of work of the field officers relates to various insanitary conditions with respect to disposal of household wastes and causes of disease and mortality within or without villages, boroughs and cities more fully mentioned under "General Sanitation."

The improvement of watersheds whose yield is wholly or materially drawn upon for public domestic consumption has demanded and received attention in one hundred and forty-eight instances involving the water supply of eight cities, one hundred and fifteen boroughs, eighteen of which are county seats, seventeen villages, four industrial supplies, two State institutions and two townships.

18. IMPROVEMENT OF WATERSHEDS.

There were inspected and reinspected during the year of 1911, properties totaling ninety-five thousand, four hundred and five located on two hundred and eighteen watersheds. Of the ninety-five thousand, four hundred and five properties all were found satisfactory except twenty-three thousand, eight hundred and five. Abatement of nuisances totaling twenty-one thousand, seven hundred and twenty were effected on ten thousand, two hundred and seventy-eight of these properties.

At the close of the year there were thirteen thousand, five hundred and twenty-seven properties upon which nuisances remained unabated. This was largely due to the fact that the inspections were made in the Fall and Winter, written orders of abatement were not served in time for changes to be made before the new year.

The eight cities whose watersheds were inspected and reinspected are as follows:—Allentown, Hazleton, Johnstown, Lancaster, New Castle, Philadelphia (Suburbs), Reading and York.

1—The City of Allentown, Lehigh County, secures its supply from the watersheds drained by Jordan Creek and Little Lehigh River. Eleven unsatisfactory properties were reinspected, twenty-four pollutions were abated on six unsatisfactory properties, leaving at the close of the year five properties in an unsatisfactory condition, one of which was referred to the Department's Attorneys.

2—The City of Hazleton, Luzerne County, is supplied with water from Quakake Creek. Fifty-four properties on the watershed were inspected and all but six were found in a satisfactory condition. Eight pollutions were abated on four properties, leaving two unsatisfactory properties unchanged at the close of the year.

3—The City of Johnstown, Cambria County, is supplied with water by the Johnstown Water Company from Mill Creek, St. Clair, Laurel, Dalton, Hinckston, Wild Cat and Salt Lick Runs. Two hundred and thirty-one properties on these watersheds were inspected and all but twelve were found in a satisfactory condition. Twenty-nine pollutions were abated on eleven properties, leaving one unsatisfactory property at the close of the year.

4—The City of Lancaster, Lancaster County, is supplied with water from the Conestoga Creek. Seven unsatisfactory properties on the watershed were reinspected and nineteen pollutions upon five unsatisfactory properties were abated, leaving two properties in an unsatisfactory condition at the close of the year.

5—The City of New Castle, Lawrence County, is supplied with water from the Shenango River. Twenty-four unsatisfactory properties were reinspected and thirty-seven pollutions were abated upon eighteen properties, leaving six properties in an unsatisfactory condition at the close of the year, four of which were referred to the Department's Attorneys.

6—Philadelphia Suburbs are supplied with water by the Springfield Water Company. One hundred and forty-four unsatisfactory properties upon the various watersheds from which their supply is taken were reinspected and two hundred and twenty-three pollutions were abated upon ninety-eight properties, leaving forty-six unsatisfactory properties at the close of the year, one of which was referred to the Department's Attorneys.

7—The City of Reading, Berks County, is supplied with water from Bernhart, Antietam and Maiden Creeks. Fifteen unsatisfactory properties on the watersheds were reinspected and twenty-six pollutions upon twelve properties were abated, leaving three properties in an unsatisfactory condition at the close of the year. Two cases were referred to the Department's Attorneys for final adjustment.

8—The City of York, York County, is supplied with water from Codorus Creek. Three hundred and eighty unsatisfactory properties on the watershed were reinspected and three hundred and fifty-seven pollutions upon one hundred and fifty-four properties were abated, leaving two hundred and twenty-six properties in an unsatisfactory condition at the close of the year, six of which were referred to the Department's Attorneys.

The eighteen Boroughs which are County Seats whose watersheds were inspected are as follows:—

1—Bedford Borough is the County Seat of Bedford County and is supplied with water from Buffalo Creek. Seven unsatisfactory properties upon the watershed were reinspected and seventeen pollutions upon six properties were abated, leaving one property in an unsatisfactory condition at the close of the year.

2—Bloomsburg Borough is the County Seat of Columbia County and is supplied with water from Fishing Creek. Thirty-six unsatisfactory properties on the watershed were reinspected and sixty-six pollutions upon thirty properties were abated, leaving six properties in an unsatisfactory condition at the close of the year.

3—Butler Borough is the County Seat of Butler County and is supplied with water from the Connoquenessing Creek. Fifty-two unsatisfactory properties on the watershed were reinspected and forty-five pollutions upon nineteen properties were abated, leaving thirty-three properties in an unsatisfactory condition at the close of the year, two of which were referred to the Department's Attorneys.

4—Carlisle Borough is the County Seat of Cumberland County and is supplied with water from the Connodoguinet Creek. Ten unsatisfactory properties on the watershed were reinspected and four pollutions upon one property were abated, leaving nine properties unsatisfactory at the close of the year.

5—Hollidaysburg Borough is the County Seat of Blair County and is supplied with water from Roaring and Blair Gap Runs, both watersheds are reported to be uninhabited.

6—Honesdale Borough is the County Seat of Wayne County and is supplied with water from Balcom Creek and Cadjaw Pond. Four unsatisfactory properties on the watershed were reinspected and fourteen pollutions upon two properties were abated, leaving two properties in an unsatisfactory condition at the close of the year.

7—Indiana Borough is the County Seat of Indiana County and is supplied with water from Two Lick Creek. Seventeen unsatisfactory properties on the watershed were reinspected and twenty-five pollutions upon twelve properties were abated, leaving five properties in an unsatisfactory condition at the close of the year, one of which was referred to the Legal Division for prosecution.

8—Lewisburg Borough is the County Seat of Union County and is supplied with water from White Deer Creek. Three properties on the watershed were inspected and all found to be in a satisfactory condition.

9—Lewistown Borough is the County Seat of Mifflin County and is supplied with water by the Lewistown and Reedsville Water Company from Minehart, Treasters, Cooper's Gap and Laurel Runs. One unsatisfactory property upon the watersheds was inspected and placed in a satisfactory condition.

10—Mauch Chunk Borough is the County Seat of Carbon County and is supplied with water from Mauch Chunk Creek in case of emergency. Thirty-nine properties on the watershed were inspected and all but two were found to be in a satisfactory condition, remaining unchanged at the close of the year.

11—Media Borough is the County Seat of Delaware County and is supplied with water from Ridley Creek. One hundred and eighty-seven properties on the watershed were inspected and all but thirty-seven were found to be in a satisfactory condition. Forty-one pollutions upon twenty-two properties were abated, leaving fifteen properties in an unsatisfactory condition at the close of the year.

12—Montrose Borough is the County Seat of Susquehanna County and is supplied with water from Jones Lake. Four unsatisfactory properties on the watershed were reinspected and four pollutions were abated upon two properties, leaving two properties in an unsatisfactory at the close of the year.

13—Stroudsburg Borough is the County Seat of Monroe County and is supplied with water from Broadhead Creek. Three unsatisfactory properties on the watershed were reinspected and two pollutions were abated upon one property, leaving two properties unchanged at the close of the year.

14—Sunbury Borough is the County Seat of Northumberland County and is supplied with water from Little Shamokin Creek. Twenty-nine unsatisfactory properties on the watershed were reinspected and forty-eight pollutions were abated upon twenty-seven properties, leaving two properties unchanged at the close of the year, one of which was referred to the Department's Attorneys.

15—Washington Borough is the County Seat of Washington County and is supplied with water from a tributary to the Ohio River. Three unsatisfactory properties on the watershed were inspected and five pollutions existing thereon were removed, leaving all properties on the watershed in a satisfactory condition at the close of the year.

16—Waynesburg Borough is the County Seat of Greene County and is supplied with water from Ten Mile Creek. Three properties on the watershed were reinspected and five pollutions existing thereon were removed, leaving all the properties on the watershed in a satisfactory condition at the close of the year.

17—Wellsboro Borough is the County Seat of Tioga County and is supplied with water from Charleston Creek, Mickle and Rock Runs. Thirty-one properties on the water shed were inspected and all but three were found to be in a satisfactory condition. The three unsatisfactory properties remained unchanged at the close of the year.

18—West Chester Borough is the County Seat of Chester County and is supplied with water from Chester Creek. Two properties on the watershed were reinspected and two pollutions existing thereon were removed, leaving all the properties on the watershed in a satisfactory condition at the close of the year. On the watersheds of Valley Creek and Broad Run, a proposed supply to the Borough of West Chester, eleven properties were reinspected. Fourteen pollutions were abated upon ten unsatisfactory properties, leaving one property unchanged at the close of the year.

The ninety-seven other Boroughs whose watersheds were inspected are as follows:—

1—Apollo Borough, Armstrong County, is supplied with water from Beaver Run. Two hundred and fifteen properties on the watershed were inspected and all but seventy were found in a satisfactory condition. Twenty-five pollutions upon twenty unsatisfactory properties were abated, leaving fifty properties in an unsatisfactory condition at the close of the year.

2—Arendtsville Borough, Adams County, is supplied with water from a spring run. One unsatisfactory property was found upon the watershed and remained unchanged at the close of the year.

3—Ashland Borough, Schuylkill County, is supplied with water from Little Mahanoy Creek. One hundred and thirty-five unsatisfactory properties on the watershed were reinspected. Sixty-seven pollutions were abated upon twenty-eight of the unsatisfactory properties, leaving one hundred and seven unsatisfactory properties at the close of the year.

4—Athens Borough, Bradford County, is supplied with water by the Fairview Water Company. The watershed of Wolcott Creek, a proposed supply was inspected. Eighty-four properties were examined and ali but two were found in a satisfactory condition, remaining unchanged at the close of the year.

5—Austin Borough, Potter County, is supplied with water from Freemans Run. Fifty-two properties on the watershed were inspected and all but twenty-one were found in a satisfactory condition. Five pollutions upon two properties were abated leaving twenty-one unsatisfactory properties unchanged at the close of the year.

6—Bangor Borough, Northampton County, is supplied with water from Martins Creek. Four unsatisfactory properties on the watershed were reinspected and seven pollutions removed, leaving all properties on the watershed in a satisfactory condition at the close of the year.

7—Bath Borough, Northampton County, is supplied with water from a tributary to Monocacy Creek. One unsatisfactory property on the watershed was reinspected and three pollutions removed, leaving all properties on the watershed in a satisfactory condition at the close of the year.

8—Bellwood Borough, Blair County, is supplied with water from Bell Gap Run. Twenty-eight properties on the watershed were reinspected and all but six were found in a satisfactory condition. Six pollutions were abated upon the six unsatisfactory properties, leaving all properties on the watershed in a satisfactory condition at the close of the year.

9—Bolivar Borough, Westmoreland County, is supplied with water by the Mace Springs Water Company from a tributary to Tub Mill Run. The one property on the watershed was found to in a satisfacotry condition. The emergency supply is taken from Bear Pond Run. Eight properties on the watershed were inspected, six of which were found to be in an unsatisfactory condition, remaining unchanged at the close of the year.

10—Bridgeport Borough, Montgomery County, is supplied with filtered water by the Bridgeport Water Company from the Schuylkill River, purchased from the Norristown Water Company.

11—Cambridge Springs Borough, Crawford County, is supplied with water from French Creek. Twenty-three hundred and forty-four properties on the watershed were inspected and all but one hundred and twenty-five were found in a satisfactory condition. One hundred and four pollutions upon fifty-four usatisfactory properties were abated, leaving seventy-one unsatisfactory properties unchanged at the close of the year. The inspection work upon this entire drainage area was not completed this year.

12—Canonsburg Borough, Washington County, is supplied with water from Chartiers Creek. Sixteen unsatisfactory properties on the watershed were reinspected and thirty-seven pollutions upon sixteen unsatisfactory properties were abated, leaving the watershed in a satisfactory condition at the close of the year.

13—Catasauqua Borough, Lehigh County, is supplied with water from Spring Creek. Two unsatisfactory properties on the watershed were reinspected. One pollution upon one unsatisfactory property was abated, leaving one unsatisfactory property at the close of the year. The abated property was referred to the Department's Attorneys for final adjustment.

14—Catawissa Borough, Columbia County, is supplied with water from Sassaman Run. Two unsatisfactory properties were found on the watershed, both of which remained unchanged at the close of the year.

15—Centralia Borough, Columbia County, is supplied with water from Roaring Creek. Six properties on the watershed were inspected and all found to be in a satisfactory condition.

16—Chapman Borough, Northampton County, does not have a public water works system, the supply being taken from individual wells and cisterns.

17—Christiana Borough, Lancaster County, is supplied with water by the Christiana Gravity Water Company from springs which are reported to be in a satisfactory condition.

18—Coatesville Borough, Chester County, is supplied with water from Heffner and Sucker Runs. Four unsatisfactory properties on the watersheds were reinspected. Five pollutions upon three unsatisfactory properties were abated, leaving one unsatisfactory property unchanged at the close of the year. One case was referred to the Department's Attorneys for final adjustment.

19—Connellsville Borough, Fayette County, is supplied with water from the Youghiogheny River. Two hundred and eighteen properties on the watershed were reinspected. Two hundred and sixty-eight pollutions were abated upon one hundred and forty-three properties, leaving seventy-five unsatisfactory properties unchanged at the close of the year. One property was referred to the Department's Attorneys for final adjustment. Connellsville Borough is also supplied with water from Laurel, Brecknock, Connell and Mounts Runs. On these watersheds forty-four properties were inspected and all but six were found in a satisfactory condition. Two pollutions were abated upon two unsatisfactory properties leaving four unsatisfactory properties unchanged at the close of the year.

20—Dauphin Borough, Dauphin County, is supplied with water by the Dauphin Consolidated Water Company from Stony and Powells Creeks. On the watershed of Powells Creek four properties were reinspected, five pollutions were abated on three properties, leaving one unsatisfactory property unchanged at the close of the year. On the watershed of Stony Creek five properties were reinspected, thirteen pollutions were abated on four properties, leaving one property unchanged at the close of the year. The Dauphin Consolidated Water Company also furnishes water to East Pennsboro Township, Cumberland County, Susquehanna and Middle Paxton Townships, Dauphin County and to the Pennsylvania Railroad Company.

21—Dowingtown Borough, Chester County, is supplied with water from a tributary to the Brandywine Creek. Four unsatisfactory properties on the water shed were reinspected. Three pollutions upon two unsatisfactory properties were abated, leaving two unsatisfactory properties unchanged at the close of the year.

22—Duncansville Borough, Blair County, is supplied with water from Fetters Run. The one property on the watershed was found to be in a satisfactory condition.

23—East Berlin Borough, Adams County, is supplied with water from the Conewago Creek. One thousand eight hundred and fifty-nine properties on the watershed were inspected and all but one hundred and twenty were found in a satisfactory condition. Nine pollutions were abated upon eight unsatisfactory properties, leaving one hundred and twelve unsatisfactory properties unchanged at the close of the year.

24—Elizabethtown Borough, Lancaster County, is supplied with water from two drilled wells and Black Run. Nine properties were inspected and found to be in a satisfactory condition.

25—Factoryville Borough, Wyoming County, is supplied with water from Lake Sheridan and Baylors Pond. One hundred and twenty-four properties were inspected and all but fifteen were found in a satisfactory condition. The unsatisfactory properties remained unchanged at the close of the year.

26—Freemansburg Borough, Northampton County, is supplied with water from individual wells, cistern's and springs, as there is no municipal water works system.

27—Gaysport Borough, Blair County, is supplied with water from Dry Gap Run. The watershed is reported to be uninhabited.

28—Glendon Borough, Northampton County, is supplied with water from individual wells, cisterns and springs, there being no municipal water works system.

29—Glenfield Borough, Allegheny County, is supplied with water from Haysville Run. Nine properties on the watershed were inspected and all but two were found in a satisfactory condition. Four pollutions were abated upon the two unsatisfactory properties.

30—Greenlane Borough, Montgomery County, is supplied with water from individual cisterns, artesian and dug wells.

31—Hanover Borough, York County, is supplied with water from the Little Conewago Creek. Eleven unsatisfactory properties on the watershed were reinspected. Twenty-three pollutions upon the eleven unsatisfactory properties were abated leaving all properties on the watershed in a good condition at the close of the year.

32—Hatboro Borough, Montgomery County, is supplied with water from an artesian well.

33—Hatfield Borough, Montgomery County is supplied with water from individual cisterns, artesian and dug wells.

34—Haysville Borough, Allegheny County, is supplied with water from Haysville Run. Nine properties on the watershel were inspected and all but two were found in a satisfactory condition. Four pollutions were abated upon the two unsatisfactory properties leaving all properties on the watershed in a good condition at the close of the year.

35—Hellertown Borough, Northampton County, is supplied with water from a spring at the head of Silver Creek, reported to be in a satisfactory condition.

36—Hummelstown Borough, Dauphin County, is supplied with water from the Swarata Creek. Three hundred and forty-four unsatisfactory properties on the watershed were reinspected. Three hundred and ninety-three pollutions upon forty-three unsatisfactory properties were abated, leaving three hundred and one properties in an unsatisfactory condition at the close of the year.

37—Jermyn Borough, Lackawanna County, is supplied with water from Rush Brook by the Scranton Gas & Water Company. Three unsatisfactory properties on the watershed were reinspected. Four pollutions were abated upon two unsatisfactory properties, leaving one unsatisfactory property unchanged at the close of the year.

38—Jersey Shore Borough, Lycoming County, is supplied with water from Larry's Creek. Seven unsatisfactory properties on the watershed were reinspected. Five pollutions were abated upon two unsatisfactory properties, leaving five unsatisfactory properties unchanged at the close of the year. The watershed of Pine Creek was inspected as a proposed supply to Jersey Shore Borough. Six thousand, six hundred and two properties on the watershed were inspected and all but one thousand, nine hundred and fifty-one were found to be in a satisfactory condition. One hundred and forty-nine pollutions upon seventy-four unsatisfactory properties were abated, leaving one thousand, eight hundred and seventy-seven unsatisfactory properties unchanged at the close of the year.

39—Juniata Borough, Blair County, is supplied with water from Homer Gap Run. One property on the watershed was inspected and found to be in a satisfacory condition.

40—Lansdale Borough, Montgomery County, is supplied with water from six artesian wells.

41—Latrobe Borough, Westmoreland County, is supplied with water from Loyalhanna Creek. One thousand two hundred and eighty-seven properties on the watershed were inspected and all but two hundred and sixty were found in a satisfactory condition. Three hundred and fifty-four pollutions were abated upon two hundred and forty-three unsatisfactory properties leaving seventeen unsatisfactory properties unchanged at the close of the year.

42—Leechburg Borough, Armstrong County, is supplied with water from Beaver Run. Two hundred and fifteen properties on the watershed were inspected and all but seventy were found in a satisfactory condition. Twenty-five pollutions upon twenty unsatisfactory properties were abated, leaving fifty unsatisfactory properties unchanged at the close of the year.

43—Ligonier Borough, Westmoreland County, is supplied with water from Furnace Run. One property on the watershed was inspected and found to be in an unsatisfactory condition. The unsatisfactory property was made satisfactory before the close of the year.

44—McDonald Borough, Washington County, is supplied with water from Raccoon Creek. Twenty-seven unsatisfactory properties on the watershed were reinspected. Fifty-five pollutions were abated upon twenty-five unsatisfactory properties, leaving two unsatisfactory properties unchanged at the close of the year.

45—McSherrystown Borough, Adams County, is supplied with water from Little Conewago Creek. Eleven unsatisfactory properties on the watershed were reinspected. Twenty-three pollutions upon the eleven unsatisfactory properties were abated, leaving all properties on the watershed in a satisfactory condition at the close of the year.

46—Marianna Borough, Washington County, is supplied with water from the North Fork of Ten Mile Creek. One hundred and ten unsatisfactory properties on the watershed were reinspected. One hundred and seventy-six pollutions upon seventy-five unsatisfactory properties were abated, leaving thirty-five unsatisfactory properties unchanged at the close of the year.

47—Martinsburg Borough, Blair County, is supplied with water from Heron Spring, which is reported to be in a satisfactory condition.

48—Meyersburg Borough, Somerset County, is supplied with water from Stamm Run. Seven properties on the watershed were inspected and all but two were found to be in a satisfactory condition. Two pollutions were abated upon the two unsatisfactory properties leaving all properties on the watershed in a satisfactory condition at the close of the year.

49—Middletown Borough, Dauphin County, is supplied with water from Swatara Creek. Three hundred and forty-four unsatisfactory properties on the watershed were reinspected. Three hundred and ninety-three pollutions were abated upon forty-three unsatisfactory properties, leaving three hundred and one unsatisfactory properties unchanged at the close of the year.

50—Mifflinburg Borough, Union County, is supplied with water from the North Branch of Buffalo Creek. The watershed above the intake is reported to be uninhabited.

51—Millersburg Borough, Dauphin County, is supplied with water from Little Wiconisco Creek. Four unsatisfactory properties upon the watershed were reinspected. Five pollutions were abated upon four unsatisfactory properties, leaving all properties on the watershed in a satisfactory condition at the close of the year.

52—Milton borough, Northumberland County, is supplied with water from White Deer Creek. The three properties on the watershed were reported to be in a satisfactory condition.

53—Mohnton Borough, Berks County, is supplied with water from Klineginna Creek. Four unsatisfactory properties on the watershed were reinspected. Seven pollutions were abated upon the four unsatisfactory properties, leaving all properties on the watershed in a satisfactory condition at the close of the year.

54—Montgomery Borough, Lycoming County, is supplied with water from Black Hole Run. One hundred and ninety-eight properties on the watershed were inspected and all but seventeen were found to be in a satisfactory condition. Thirty-eight pollutions were abated upon sixteen unsatisfactory properties, leaving one unsatisfactory property unchanged at the close of the year.

55—Mt. Joy Borough, Lancaster County, is supplied with water from Little Chicquesalunga Creek. Four unsatisfactory properties on the watershed were reinspected, remaining unchanged at the close of the year, one case having been referred to the Department's Attorneys.

56—Muncy Borough, Lycoming County, is supplied with water from Glade Run. Eleven properties on the watershed were inspected and all but five were found in a satisfactory condition. Six pollutions were abated upon the five unsatisfactory properties leaving all properties on the watershed in a satisfactory condition at the close of the year.

57—Nazareth Borough, Northampton County, is supplied with water by the Blue Mountain Water Company from a tributary to the Lehigh River. Thirteen properties on the watershed were inspected and all but five were found in a satisfactory condition. Seven pollutions were abated upon four unsatisfactory properties, leaving one unsatisfactory property unchanged at the close of the year.

58—New Bethlehem Borough, Clarion County, is supplied with water from Red Bank and Sandy Lick Creeks. Seven hundred and seventy-two properties on the watershed were inspected and reinspected and all but one hundred and ninety-one were found in a satisfactory condition. One hundred and ninety-eight pollutions were abated upon eighty-five unsatisfactory properties, leaving one hundred and six unsatisfactory properties unchanged at the close of the year.

59—New Cumberland Borough, Cumberland County, is supplied with water from the Yellow Breeches Creek. Three thousand four hundred and ninety-five properties on the watershed were inspected and all but one hundred and thirty-eight were found to be in a satisfactory condition. One hundred and sixty-four pollutions were abated upon ninety-nine unsatisfactory properties, leaving thirty-nine unsatisfactory properties unchanged at the close of the year.

60—New Florence Borough, Westmoreland County, is supplied with water from Baldwin Run. The watershed is reported to be uninhabited above the intake.

61—Northampton Heights Borough, Northampton County is supplied with water by individual wells, cisterns and springs.

62—Northampton Borough, Northampton County, is supplied with water from Spring Creek. Two unsatisfactory properties on the watershed were reinspected. One pollution upon one unsatisfactory property was abated, leaving one unsatisfactory property unchanged at the close of the year. The abated property was referred to the Legal Division during the year.

63—North Catasaqua Borough, Northampton County, is supplied with water from Spring Creek. Two unsatisfactory properties on the watershed were reinspected. One pollution upon one unsatisfactory property was abated, leaving one unsatisfactory property unchanged at the close of the year. The abated property was referred to the Legal Division during the year.

64—North Wales Borough, Montgomery County, is supplied with water by the North Wales Water Company from four artesian wells and by the Independent Water Company from one artesian well.

65—Ortanna Borough, Adams County, is supplied with water from Birch Run. One unsatisfactory property on the watershed was inspected and remained unchanged at the close of the year.

66—Osborne Borough, Allegheny County, is supplied with water from Haysville Run. Nine properties were inspected on the watershed and all but two were found to be in a satisfactory condition. Four pollutions upon the two unsatisfactory properties were abated, leaving all properties on the watershed in a satisfactory condition at the close of the year.

67—Patton Borough, Cambria County, is supplied with water from Chest Creek. Two hundred and sixty-five properties on the watershed were inspected and all but thirty-three were found in a satisfactory condition. Seventy pollutions were abated upon twenty-nine unsatisfactory properties leaving four unsatisfactory properties unchanged at the close of the year, two of which were referred to the Department's Attorneys.

68—Pen Argyl Borough, Northampton County, is supplied with water by the Blue Mountain Water Company from a tributary to the Lehigh River. Thirteen properties on the watershed were inspected and all but five were reported to be in a satisfactory condition. Seven pollutions were abated upon four unsatisfactory properties leaving one unsatisfactory property unchanged at the close of the year.

69—Portland Borough, Northampton County is supplied with water from Slateford Creek. One unsatisfactory property on the watershed was reinspected and reported to be in a satisfactory condition at the close of the year.

70—Punxsutawney Borough, Jefferson County, is supplied with water from Clover Run and East Branch of Mahoning Creek. Two hundred and sixteen properties on these watersheds were inspected and all but thirty-two were found to be in a satisfactory condition. Thirty-seven pollutions were abated upon twenty-nine unsatisfactory properties, leaving three unsatisfactory properties unchanged at the close of the year.

71—Quarryville Borough, Lancaster County, is supplied with water from Reed and Silver Springs with an emergency intake on McAllisters Run. Six properties on the watershed of McAllisters Run were inspected and found to be in a satisfactory condition.

72—Red Hill Borough, Montgomery County, is supplied with water from individual wells, springs and cisterns.

73—Renovo Borough, Clinton County, is supplied with water from Drury and Paddys Runs. Twenty properties on the watershed were inspected and all but seven were found to be in a satisfactory condition. Two pollutions were abated upon one unsatisfactory property, leaving six unsatisfactory properties unchanged at the close of the year.

74—Royalton Borough, Dauphin County, is supplied with water from Swatara Creek. Three hundred and forty-four unsatisfactory properties upon the watershed were reinspected. Three hundred and ninety-three pollutions were abated upon one hundred and forty-three unsatisfactory properties, leaving two hundred and one unsatisfactory properties unchanged at the close of the year.

75—Royersford Borough, Montgomery County, is supplied with filtered water from the Schuylkill River.

76—Sayre Borough, Bradford County, is supplied with water by the Fairview Water Company. The watershed of Wolcott Creek, a proposed supply was inspected. Eighty-four properties on the watershed were inspected and all but two were found to be in a satisfactory condition. The two unsatisfactory properties remained unchanged at the close of the year.

77—Schuylkill Haven Borough, Schuylkill County, is supplied with water from Panther Run. One unsatisfactory property upon the watershed was reinspected and reported to be in a satisfactory condition at the close of the year.

78—Schwenksville Borough, Montgomery County, is supplied with water from individual cisterns, artesian and dug wells.

79—Scottdale Borough, Westmoreland County, is supplied with water from Green Lick Creek, Spruce Run, Mounts Creek, Butler Run and Indian Creek. Two hundred and nine properties on the watershed were inspected and all but forty-eight were found to be in a satisfactory condition. Thirty-three pollutions were abated upon twenty-nine unsatisfactory properties leaving nineteen unsatisfactory properties unchanged at the close of the year, one of which was referred to the Department's Attorneys.

80—Selinsgrove Borough, Snyder County, is supplied with water from Penns Creek. Ten unsatisfactory properties on the watershed were reinspected. Twelve pollutions were abated upon eight of the unsatisfactory properties, leaving two unsatisfactory properties unchanged at the close of the year, four of which were referred to the Department's Attorneys.

81—Shamokin Borough, Northumberland County, is supplied with water from Trout Run. Four properties on the watershed were inspected and reported to be in a satisfactory condition.

82—Shillington Borough, Berks County, is supplied with water from the Klineginna Creek. Four unsatisfactory properties on the watershed were inspected. Seven pollutions were abated upon the four unsatisfactory properties, leaving all properties on the watershed in a satisfactory condition at the close of the year.

83—Souderton Borough, Montgomery County, is supplied with water from springs and artesian wells.

84—South Fork Borough, Cambria County, is supplied with water from Sandy Run. One unsatisfactory property on the watershed was reinspected, and reported to be in a satisfactory condition at the close of the year.

85—Stockerton Borough, Northampton County, is supplied with water from individual wells.

86—Susquehanna Borough, Susquehanna County, is supplied with water from Conewacta Creek. Three unsatisfactory properties on the watershed were reinspected. Four pollutions upon one unsatisfactory property were abated, leaving two unsatisfactory properties unchanged at the close of the year.

87—Tatamy Borough, Northampton County, is supplied with water from individual wells.

88—Telford Borough, Bucks County, is supplied with water from artesian and dug wells.

89—Tyrone Borough, Blair County, is supplied with water from Sinking and Deckers Runs. Five properties on the watershed were inspected and three were found to be in a satisfactory condition. Six pollutions upon the three unsatisfactory properties were abated, leaving all properties on the watershed in a satisfactory condition at the close of the year.

90—Walnutport Borough, Northampton County, is supplied with water by the Blue Mountain Water Company from a tributary to the Lehigh River. Thirteen properties on the watershed were inspected and all but five were found in a satisfactory condition. Seven pollutions were abated upon four unsatisfactory properties, leaving one unsatisfactory property unchanged at the close of the year.

91—Watsontown Borough, Northumberland County, is supplied with water from White Deer Creek. Three properties on the watershed were inspected and found to be in a satisfactory condition.

92—Waymart Borough, Wayne County, is supplied with water from Vanauken Creek. Twenty-three properties on the watershed were inspected and all but five were found to be in a satisfactory condition. Ten pollutions on four unsatisfactory properties were abated, leaving one unsatisfactory property unchanged at the close of the year.

93—West Conshohocken Borough, Montgomery County, is supplied with water from Queen Valley Creek. Fourteen properties on the watershed were inspected and all but two were found to be in a satisfactory condition. Two pollutions on one unsatisfactory property were abated, leaving one unsatisfactory property unchanged at the close of the year.

94—West Telford Borough, Montgomery County, is supplied with water from artesian and dug wells.

95—Williamsburg Borough, Blair County, is supplied with water from Smuckers and Snare Runs. One property on the watersheds was inspected and found to be in a satisfactory condition.

96—Wind Gap Borough, Northampton County, is supplied with water by the Blue Mountain Water Company from a tributary to the Lehigh River. Thirteen properties on the watershed were inspected and all but five were found to be in a satisfactory condition. Seven pollutions were abated upon four unsatisfactory properties, leaving one unsatisfactory property unchanged at the close of the year.

97—Wyalusing Borough, Bradford County, is supplied with water from Stalford Brook. Six properties on the watershed were reinspected. Eleven pollutions upon the six unsatisfactory properties were abated, leaving all properties on the watershed in a satisfactory condition at the close of the year.

The seventeen Villages whose watersheds were inspected are as follows:—

Boyer Heights, Brookside, Millmont, Oakbrook and Oakland Villages, Berks County, are supplied with water from Angelica Creek. One unsatisfactory property on the watershed was reinspected. One pollution on the one unsatisfactory property remained unchanged at the close of the year and was referred to the Legal Division.

Burnham, Naginey and Siglerville Villages, Mifflin County, are supplied with water by the Lewistown and Reedsville Water Company from Treasters Run. One unsatisfactory property on the watershed was reinspected. One pollution on the one unsatisfactory property was abated, leaving the watershed in a satisfactory condition at the close of the year.

Garfield Village, Westmoreland County, is supplied with water by the Mace Springs Water Company from a tributary to Tub Mill Run. The one property on the watershed was found to be in a satisfactory condition. The emergency supply is taken from Bear Pond Run. Eight properties on the watershed were inspected, six of which were found to be in an unsatisfactory condition and remained unchanged at the close of the year.

Glen Campbell Village, Indiana County, is supplied with water from Brady Run. Eight properties on the watershed were inspected and all but one were found to be in a satisfactory condition, which remained unchanged at the close of the year.

Hazelhurst Village, McKean County, is supplied with water from springs which are reported to be in a satisfactory condition.

Koppel Village, Beaver County, is supplied with water from a tributary to Semour Hollow Run. One property on the watershed was inspected and was found to be in an unsatisfactory condition. One pollution on the one unsatisfactory property was abated, leaving the watershed in a satisfactory condition at the close of the year.

Packerton Village, Carbon County, is supplied with water from Beaver Run. Thirty-three properties on the watershed were inspected and all but five were found to be in a satisfactory condition. Three pollutions were removed from one unsatisfactory property, leaving four properties unchanged at the close of the year.

Palmerton Village, Carbon County, is supplied with water from Pohopoco Creek. Six hundred and fifty-nine properties on the watershed were inspected and all but sixty-eight were found to be in a satisfactory condition. Seventy-three pollutions were abated on fifty unsatisfactory properties, leaving eighteen unsatisfactory properties unchanged at the close of the year.

Rauchtown Village, Clinton County, is supplied with water from Nippenose Creek. Three properties on the watershed were reinspected. Nine pollutions were removed from the three unsatisfactory properties, leaving all properties on the watershed in a satisfactory condition at the close of the year.

Simpson Village, Lackawanna County, is supplied with water by the Belmont Water Company from a spring run. Seven properties were inspected on the watershed and were found to be in an unsatisfactory condition. Twenty-two pollutions were abated on the six unsatisfactory properties, leaving one property unchanged at the close of the year.

Templeton Village, Armstrong County, is supplied with water by the Peart-Snyder Water Company from a twenty-four foot drilled well.

The High Ridge Water Supply Company supplies water to the following stations along the Pennsylvania Railroad from Big Spring, Tub Mill and Poplar Hill Runs:—Saxman, Derry, New Florence, Lockport, Boliver, Blairsville and Hillside. Five properties on the above watersheds were inspected and three were found to be in an unsatisfactory condition. Six pollutions were abated upon the three unsatisfactory properties, leaving all properties on the watershed in a satisfactory condition at the close of the year.

The Lehigh Valley Railroad shops at Packerton are supplied with water from Beaver Run. Three hundred and thirty-three properties on the watershed were inspected and all but five were found to be in a satisfactory condition. Three pollutions were removed from one unsatisfactory property leaving four unsatisfactory properties on the watershed unchanged at the close of the year.

The Pennsylvania Railroad shops at Altoona are supplied with water from Bell Gap Run. Twenty-eight properties on the watershed were inspected and all but six were found in a satisfactory condition. Six pollutions were abated upon the six unsatisfactory properties, leaving all properties on the watershed in a satisfactory condition at the close of the year.

The Philadelphia and Erie Railroad Company shops at Renovo are supplied with water from Drury and Paddy Runs. Twenty properties on the watershed were inspected and all but seven were found to be in a satisfactory condition. Two pollutions were abated upon one unsatisfactory property, leaving six unsatisfactory properties unchanged at the close of the year.

Mt. Carmel Township, Northumberland County, is supplied with water by the Bear Gap Water Company from Roaring Creek. Thirteen properties on the watershed were inspected and all found to be in a satisfactory condition. The Bear Gap Water Company also sells water to the Kulpmont Water Company, Marion Heights Water Company, Mt. Carmel Water Company, Greno Water Company, Philadelphia and Reading Railway Company, Reading Coal and Iron Company, Shipman Coal Company and the Susquehanna Coal Company.

Moreland Township, Montgomery County, is partly supplied with water by the Moreland Springs Water Company from Pennypack Creek. Four hundred and fifty-three properties on the watershed were inspected and all but one hundred and ten were found to be in a satisfactory condition. One hundred and seventy-seven pollutions were abated upon seventy-six unsatisfactory properties, leaving thirty-four properties on the watershed in an unsatisfactory condition at the close of the year.

The Western State Institution for Feeble Minded at Polk, Venango County, is supplied with water from Little Sandy Creek. Ninety-three properties on the watershed were inspected and all but fifteen were found to be in a satisfactory condition. Seventeen pollutions were abated upon the fifteen unsatisfactory properties, leaving all the properties on the watershed in a satisfactory condition at the close of the year.

The Western Penitentiary located in Benner Township, Centre County, propose to take their water supply from a spring run in McBridges Gap. Seven properties on the watershed were inspected and found to be in a satisfactory condition.

19. GENERAL SANITATION.

Some industrial pollutions cannot be classed as sewage pollutions under the law. They may bring about a very unsanitary condition in a natural water course, requiring to be abated on the score of a common nuisance.

Pollution of the ground water supply by sewage from a village or town or any other source is matter for investigation and action by the State Department of Health. The Commissioner of Health is charged with the preservation of the purity of such waters in the interests of public health. All such work done by field officers which has to deal with the disposal of sewage in villages, and towns comes more particularly under the work of municipal sanitation. In many villages and hamlets throughout the State general practices respecting disposal of household wastes are insanitary and possibly the cause of disease and mortality. These subjects are properly investigated by the Department of Health, since there is no other body having jurisdiction in the fifteen hundred townships wherein reside about one third of the population of the Commonwealth. This class of work is distinct from other field office work and is treated under the head of General Sanitation.

Within the city, borough, village and township the remedy for the various nuisances in the streams, the pollution of public ground water supply, general unsanitary conditions respecting disposal of household wastes and causes of disease and mortality is found quite often to be a public sewerage system. Considerable time must be allowed naturally for discussion of the introduction of such an improvement and for the inauguration of a sewer system. Therefore, it is not reasonable to expect immediate abatements of those thousands of pollutions within the municipalities. However, the sanitary survey forms a basis upon which to make a beginning.

The following tables give a summary of sanitary surveys on certain watersheds, and a summary of sanitary surveys in certain boroughs, villages and townships:—

SUMMARY OF SANITARY SURVEY ON CERTAIN WATERSHEDS.

	Occupied Properties Inspected and Re-inspected on watersheds			Abatements.		
	Total.	Satisfactory.	Stream Menaces.	Estates.	Pollutions.	Properties Unchanged.
Wissahickon Creek, Montgomery County, ...	226	11	215	169	328	46
Tacony Creek, Montgomery County, ...	1774	1545	229	24	48	205
Cobbs Creek, Montgomery County, ...	1210	1180	30	19	33	11
Darby Creek, Delaware County, ...	337	0	337	202	526	135
Chester Creek, Delaware County, ...	217	0	217	115	251	102
Cobbs Creek, Delaware County, ...	199	0	199	62	166	137
Marcus Hook Creek, Delaware County, ...	71	0	71	4	5	67
Brandywine Creek, Delaware County, ...	28	0	28	18	26	10
Naamans Creek, Delaware County, ...	17	0	17	14	18	3
Ridley Creek, below Media intake, Delaware County, ...	48	0	48	23	43	25
Crum Creek, below Springfield Water Co., intake, Delaware County, ...	129	0	129	12	39	117
Perkiomen Creek, Lehigh, Montgomery and Bucks Counties, ...	31	0	31	16	44	15
Mahoning Creek, Jefferson, Indiana and Armstrong Counties, ...	5231	4062	1169	1083	1707	86
Big Elk Creek, Chester County, ...	34	0	34	33	63	1
Brandywine Creek, Chester County, ...	59	0	59	42	95	17
Chester Creek, Chester County, ...	46	0	46	25	73	21
Christiana Creek, Chester Couuty, ...	2	0	2	1	2	1
Conestoga Creek, Chester County, ...	1	0	1	1	2	0
Darby Creek,, Chester County, ...	8	0	8	7	9	1
East Brandywine Creek, Chester County, ...	65	0	65	59	103	6
Little Elk Creek, Chester County, ...	2	0	2	2	4	0
Octorora Creek, Chester County, ...	29	0	29	26	46	3
Pequea Creek, Chester County, ...	5	0	5	5	7	0
Red Clay Creek, Chester County, ...	53	0	53	43	83	10
Ridley Creek, Chester Couty, ...	8	0	8	6	8	2
West Brandywine Creek, Chester County,, ...	263	0	263	218	598	45
White Clay Creek, Chester County, ...	76	0	76	60	142	16
Little Swatara Creek, Berks County, ...	11	0	11	7	13	4
Darby Creek above Devon sewage disposal plant, Chester County, ...	302	293	9	8	8	1
Lizard Creek, Carbon County, ...	497	437	60	49	72	11
Mahoning Creek, Carbon and Schuylkill Co's.	382	318	64	49	80	15
Aquashicola Creek, Carbon and Monroe Co's...	1182	1012	170	155	219	15
Octorora Creek, Lancaster County, ...	1324	1266	58	26	55	32
Little Conestoga Creek, Lancaster Co., ...	1395	1294	101	8	34	93
Big Conestoga Creek, Lancaster County, ...	2658	2478	180	19	31	161
Big Chiquesalunga Creek, Lancaster County, .	1205	1149	56	22	32	34
Pequea Creek, Lancaster County, ...	3646	3420	226	94	177	132
Bushkill Creek, Northampton County, ...	77	0	77	63	132	14
Monocacy Creek, Northampton County, ...	410	337	73	62	114	11
Martins Creek, Northampton County, ...	95	0	95	74	128	21
Conewago Creek, Dauphin and Lebanon Co's,.	583	566	17	11	32	6
Little Darby Creek, above Mill Dam Club, Chester County, ...	14	0	14	9	12	5
Beaver Run, below L. V. R. R. and Packerton Village, intake, Carbon County, ...	31	27	4	4	8	0
Mauch Chunk Creek, below Mauch Chunk intake, Carbon County, ...	46	38	8	8	22	0
Quakake Creek, below Hazleton intake, Carbon County, ...	51	44	7	7	16	0
Red Bank Creek, below New Bethlehem intake, ...	968	775	193	159	205	34
Pennypack Creek, below Moreland Springs Water Company's intake, ...	184	152	32	22	47	10
Loyalhanna Creek, below Latrobe intake, ..	74	63	11	0	0	11
Neshaminy Creek, below Springfield Water Company's intake, ...	373	291	82	56	149	26
Laurel Run, Houston Township, Clearfield County, ...	6	0	6	5	17	1
Cumberland, Jefferson, Monongahela Townships and Carmichael Borough, Green County, ..	984	801	183	148	213	35
Inspection of cottages along Lake Erie, ...	299	223	76	74	142	2
Beaver Creek, Quarryville Borough, Lancaster County, ...	23	0	23	8	26	15
Muddy Run in Huntingdon Borough, ...	42	2	40	17	48	23
Tacony Creek in Jenkintown Bo.ough, ...	65	4	61	0	0	61
Total, ...	27096	21788	5308	3453	6601	1855

It will be noted that eighteen properties on the watersheds of Ice Supplies were inspected and reinspected and all of them contained water pollutions. Twenty-eight pollutions were removed upon eleven estates, leaving seven unsatisfactory properties at the close of the year.

	Occupied Properties Inspected and Re-inspected on watersheds			Abatements.		
	Total.	Satisfactory.	Stream Menaces.	Estates.	Pollutions.	Properties Unchanged.
Ablec Ice Supply, St. Marys Borough, ...	2	0	2	2	4	0
Catholic Sisters Ice Supply, St. Marys Borough, ...	3	0	3	3	7	0
Fosters Ice Pond, St. Marys Borough, ...	5	0	5	5	16	0
Snavely's Ice Pond, Penn Township, Lancaster County, ...	1	0	1	1	1	0
Schuylkill Haven Borough Ice Supply, ...	5	0	5	0	0	5
Orwigsburg Borough Ice Supply, ...	2	0	2	0	0	2
Totals, ...	18	0	18	11	28	7

SUMMARY OF SANITARY SURVEY IN CERTAIN BOROUGHS AND VILLAGES AND ONE TOWNSHIP.

	Occupied Properties Inspected and Re-inspected.			Abatements.		
	Total.	Satisfactory.	Stream Menaces.	Estates.	Pollutions.	Properties Unchanged.
Ambler Borough, Montgomery County, ...	211	0	211	51	190	160
Bangor Borough, Northampton County, ...	1614	1113	501	0	0	501
Bath Borough, Northampton County, ...	2	0	2	0	0	2
Bridgeport Borough, Montgomery Co., ...	846	301	545	0	0	545
Carlisle Borough, Cumberland County, ...	3128	3127	1	0	0	1
Christiana Borough, Lancaster County, ...	298	95	203	0	0	203
Collegeville Borough, Moutgomery County, ...	188	184	4	0	0	4
Conshohocken Borough, Montgomery County, .	1629	1620	9	0	0	9
Dillsburg Borough, York County, ...	292	273	19	0	0	19
East Bangor Borough, Northampton County, .	323	293	30	0	0	30
East Greenville Borough, Montgomery County,	399	343	56	0	0	56
Freemansburg Borough, Northampton County,	240	227	13	0	0	13
Glendon Borough, Northampton County, ...	209	199	10	0	0	10
Greenlane Borough, Montgomery County, ...	95	86	9	0	0	9
Hatfield Borough, Montgomery County, ...	191	133	58	0	0	58
Hellertown Borough, Northampton County, ..	280	264	16	0	0	16
Lansdale Borough, Montgomery County, ...	1037	209	828	0	0	828
McConnellsburg Borough, Fulton County, ...	196	170	26	0	0	26
Millheim Borough, Centre County, ...	12	0	12	12	16	0
Morrisville Borough, Bucks Couny, ...	2	0	2	2	2	0

SUMMARY OF SANITARY SURVEY IN CERTAIN BOROUGHS AND VILLAGES AND ONE TOWNSHIP—Continued.

	Occupied Properties Inspected and Re-inspected.			Abatements.		
	Total.	Satisfactory.	Stream Menances.	Estates.	Pollutions.	Properties Unchanged.
Myersdale Borough, Somerset County, ...	553	116	437	0	0	437
Narberth Borough, Montgomery County, ...	511	510	1	0	0	1
Nazareth Borough, Northampton County, ...	1146	1087	59	0	0	59
Northampton Heights, Northampton County, ..	254	252	2	0	0	2
North Catasauqua Borough, Northampton Co.,	471	470	1	0	0	1
North Wales Borough, Montgomery County,	539	348	191	0	0	191
Patton Borough, Cambria County, ...	750	247	503	0	0	503
Pen Argyl Borough, Northampton Co., ...	1082	1042	41	0	0	41
Pennsburg Borough, Montgomery County, ...	337	329	8	0	0	8
Perkasie Borough, Bucks County, ...	734	538	196	25	77	171
Portland Borough, Northampton Co., ...	223	206	17	0	0	17
Quarryville Borough, Lancaster Co., ...	225	198	27	0	0	27
Red Hill Borough, Montgomery County, ...	170	170	0	0	0	0
Rock Hill Borough, Huntingdon Co., ...	3	0	3	1	2	2
Royersford Borough, Montgomery Co., ...	802	711	91	0	0	91
Salisbury Borough, Somerset County, ...	112	109	3	0	0	3
Schwenksville Borough, Montgomery County,	125	106	19	18	40	1
Sellersville Borough, Bucks County, ...	418	295	123	0	0	123
Souderton Borough, Montgomery County, ...	521	92	429	0	0	429
Stockerton Borough, Northampton County, ...	163	156	7	0	0	7
Tatamy Borough, Northampton Co., ...	150	144	6	0	0	6
Telford Borough, Bucks County, ...	53	53	0	0	0	0
Trappe Borough, Montgomery County, ...	112	109	3	0	0	3
Walnutport Borough, Northampton Co., ...	292	251	41	0	0	41
West Conshohocken Borough, Montgomery Co.,	511	362	149	0	0	149
West Easton Borough, Northampton County, .	255	235	20	0	0	20
West Telford Borough, Montgomery County, ..	171	146	25	0	0	25
Wind Gap Borough, Northampton County, ..	274	253	21	0	0	21
Croyle Township, Cambria County, ...	1	0	1	1	3	0
Total, ...	22151	17172	4979	110	330	4869

SUMMARY OF SANITARY SURVEY OF CERTAIN MAJOR WATERSHEDS.

	Occupied Properties Inspected and Re-inspected on watersheds			Abatements.		
	Total.	Satisfactory.	Stream Menances.	Estates.	Pollutions.	Properties Unchanged.
Ohio River, Washington County, ...	1238	0	1238	941	1696	297
Ohio River, Allegheny County, ...	3736	0	3736	1976	5426	1760
Allegheny River, Butler and Mercer Counties,	4	0	4	4	8	0
Allegheny River, McKean County, ...	3213	2715	498	431	837	67
Allegheny River, Clarion County and Armstrong County, ...	436	344	92	85	139	7
Allegheny River, Westmoreland County, ...	640	563	77	45	59	32
Clarion River, Clarion County, ...	78	67	11	9	24	2

SUMMARY OF SANITARY SURVEY OF CERTAIN MAJOR WATERSHEDS —Continued.

	Occupied Properties Inspected and Re-inspected on watersheds			Abatements.		
	Total.	Satisfactory.	Stream Menaces.	Estates.	Pollutions.	Properties Unchanged.
Beaver River, Beaver and Lawrence Counties,	23	0	23	3	3	20
Mahoning River, Lawrence County,	3	0	3	3	3	0
Lehigh River, Lehigh County,	36	0	36	23	51	13
Lehigh River, Carbon County,	2872	2530	342	196	397	146
Lehigh River, Luzerne County,	926	896	30	0	0	30
Lehigh River, Monroe County,	144	144	0	0	0	0
Lehigh River, Wayne County,	147	141	6	0	0	6
Lehigh River, Northampton County,	1387	1146	241	203	462	38
Schuylkill River, Montgomery County,	3435	2857	578	311	478	264
Schuylkill River, Delaware County,	37	0	37	27	27	10
Schuylkill River, Berks and Lebanon Counties,	333	0	333	134	248	199
Schuylkill River, Carbon County,	8	7	1	1	2	0
Schuylkill River, Chester County,	97	0	97	86	166	11
Delaware River, Delaware County,	54	0	54	7	12	47
Delaware River, Northampton County,	138	0	138	113	165	25
Susquehanna River, Clearfield and Indiana Counties,	357	338	19	18	31	1
Susquehanna River, Lancaster County,	2534	2321	213	66	163	147
Susquehanna River, Carbon County,	255	253	2	0	0	2
Conemaugh River, Westmoreland County,	677	530	147	39	47	108
Kiskiminetas River, Westmoreland County,	768	582	186	71	93	115
Monongahela River, Westmoreland County,	814	709	105	62	66	43
Total,	24390	16143	8247	4857	10803	3390

V. EPIDEMICS.

During the year 1911, the Engineering Division, under the direction of the Chief Engineer, undertook operations at fourteen places relative to investigating the cause of outbreaks of typhoid fever and executing instructions of the Commissioner of Health to obviate a recurrence of the disease as far as water supply, sewerage and sanitary conditions were concerned. These places, named in alphabetical order, were as follows:

1. Athens, Sayre and S. Waverly.
2. Austin.
3. Bethlehem.
4. Bloomsburg.
5. Erie.
6. Marianna.
7. Marysville.
8. Millvale.
9. Montgomery.
10. New Oxford.
11. Parker.
12. Patton.
13. So. Bethlehem.
14. Tarentum.

In the following pages a description of the operations at each place is given.

20. TYPHOID FEVER AT ATHENS, SAYRE AND SOUTH WAVERLY.

The boroughs of Athens, Sayre and South Waverly, all in Bradford County, experienced an outbreak of typhoid fever during July, August and September of 1911. Assistant Engineer Howard E. Moses, and Inspector Zeigler of the Engineering Division of the Department were assigned to the investigation. The operations of the Department are described in the following report prepared by Mr. Moses.

General Conditions.

The districts under discussion lie in the extreme north central part of Bradford County and occupy a tract of land triangular in shape formed by the confluence of the Susquehanna and the Chemung rivers which unite about six miles south of the New York-Pennsylvania State line. The borough of Athens lies directly at the forks, north of which and adjacent thereto is the small borough of Sayre. Between Sayre and the State line is the small borough of South Waverly. Directly north of South Waverly over the line is the village of Waverly, New York State. This lies immediately adjacent to South Waverly, the State line forming an arbitrary boundary between the two municipalities. The four towns just enumerated virtually form one compact municipality, although each has its own separate internal government.

Of the three Pennsylvania towns the borough of Sayre is the largest and probably the most important, at least from an industrial standpoint. Here are located the extensive shops of the Lehigh Valley Railroad, which, together with the railroad, furnish employment for the majority of the workers in the entire district. Athens and South Waverly are largely given over to residential purposes. Waverly, New York, has a number of comparatively small industrial operations. None of these municipalities shows any marked growth during the last decade, in fact, South Waverly has decreased in population. They had a combined population in 1910 of 11,300 inhabitants residing as follows: in Athens 3,796, in Sayre 6,426, in South Waverly 1,084. The village of Waverly at the same time had a population of 4,855; or a total population of the district of approximately 16,000 persons.

Each town is spread out over a large area and presents a good appearance. The streets are wide and well shaded, and it is said that the majority of the homes are owned by the occupants thereof. Evidences of a progressive spirit abound on all sides. Each municipality has a public water works system, and each borough, except South Waverly, has a public sewer system, this being also true of Waverly village. Athens and Sayre are furnished with water by the Sayre Water Company which obtains its supply from the Susquehanna River at a point opposite Sayre Borough. Waverly village in New York State and South Waverly Borough in Pennsylvania are served by the Waverly Water Company, obtaining its supply from a small surface stream about a mile and a quarter northwest of Waverly village.

The supply for South Waverly is furnished by the Waverly Water Company, a New York State Corporation, through the distribution system of the South Waverly Water Company, incorporated in the State of Pennsylvania, April 18, 1881. Subsequent to this date, after the distribution mains had been laid they were leased to the Waverly Water Company and the South Waverly supply is furnished by the Waverly Water Company at the New York-Pennsylvania State line. A connection is also had between the distribution system of the South Waverly Water Company and the water works system of the Sayre Water Company for emergency purposes. It does not appear that recourse has ever been had to this latter source of supply. South Waverly has no independent supply.

The source of supply for the Waverly Water Company is a small stream known as Dry Brook. This stream rises in Barton Town, two and one-half miles north of Waverly Village. The water company has dammed Dry Brook at a point in the town one and one-quarter miles northwest of Waverly Village. Two earth dams with concrete core walls are erected at this point forming an upper and a lower reservoir above which Dry Brook has a watershed area of 1,292 acres. The upper and lower reservoirs hold 90,000,000 and 30,000,000 gallons of water respectively and have maximum depths of 25 feet and 47 feet respectively. The upper reservoir is used for storage purposes only and the water from this basin is drawn off to the lower reservoirs through a 14 inch connecting pipe passing through the embankment. The lower reservoir constitutes the distributing reservoir and from it the 12 inch gravity supply main extends into Waverly village where it connects with the distribution system which extends over into South Waverly Borough. This supply is used quite generally in both municipalities. In South Waverly the daily consumption is said to amount to 104,000 gallons of which amount 30,000 gallons are used for domestic purposes, the balance being supplied to the Lackawanna Railroad.

The watershed of Dry Brook tributary to the reservoirs comprises mostly cleared land, upon which there are approximately ten farms. This watershed is supervised by the Health Department of New York State, and there are said to be no polluting properties on it. Dry Brook has a very low minimum flow.

A sample of this water supply was secured on August 18, 1911, by a representative of the Pennsylvania Department of Health, being taken from Dry Brook itself at a point 1,000 feet above the upper reservoir. This, upon analysis in the Department's laboratories did not show any evidence of sewage contamination. A tap sample of the same supply collected in Waverly village on this date showed no evidence of sewage contamination.

The Sayre Water Company, which concern supplies the boroughs of Sayre and Athens, was incorporated August 25, 1881. The existing water works system comprises a pumping station and filtration plant located in the borough of Sayre on the west bank of the Susquehanna River, a storage reservoir and distribution systems in Sayre and Athens. It is reported that about 70 per cent. of the population in the two boroughs use this water for all purposes. About 10 per cent. have other sources of supply, chiefly drilled wells, and the remainder of the inhabitants of the two towns make a partial use of the public water supply.

The supply of the Sayre Water Company is taken from an intake crib located in mid-stream about 350 feet out from the west bank of the river. About two miles above the crib Shepards Creek empties into the river from the west. This stream receives sewage from Waverly village. Above Sayre the Susquehanna River has a large watershed in New York and Pennsylvania on which are many municipalities sewering into the stream. At Sayre the outfall sewers discharge into the river below the pumping station and intake crib.

The intake crib is 22 feet square and 8 feet deep built of rock and concrete. The two sides of the square which face down the stream are open and provided with screens. Through these screens the river water passes into the crib and flows thence by gravity through a 20 inch pipe to the pump well located on the river bank alongside the pumping station. The intake pipe can be back-flushed with filtered water.

The pump well is circular in shape, 26 feet deep, located 60 feet from the river bank, and from it a 16 inch and a 20 inch suction pipe, located 4 feet and 5 feet above the bottom of the well, respectively, extend to the 3 million gallon pump and the 5 million gallon pump, respectively. The bottom of the well is 7½ feet below the low water mark of the river, as are also the suction pipes.

In the pumping station are located two pumps having a combined capacity of 8 million gallons and the necessary boiler equipment for the operation of the plant. Adjacent to the pump house is the filtration plant built in 1904. The filtering equipment consists of eight pressure sand filters of one-half million gallons each, or a total capacity of 4 million gallons. The filters are by-passed so that raw water can be introduced into the distribution system. The plant is equipped with two coagulant tanks in which the alum solution is prepared and delivered thence to the intake pipe. Outside the filter plant the force main connects with the distribution system and the storage reservoir, which is located on the opposite side of the river. This basin has a capacity of 3 million gallons.

In 1910 a satisfactory test of the filtration plant at Sayre was conducted by the Engineering Division of the Department. It was ascertained at that time that the average consumption of water was one and one-half million gallons daily of which 15 per cent. is used for industrial purposes; 55 per cent. for domestic purposes, 10 per cent. for public purposes, and 20 per cent. for washing. The average rate of filtration is equivalent to a rate of 98 million gallons to the acre in twenty-four hours. The average per capita consumption rate is 110 gallons daily. Generally speaking, the analyses of samples of water taken during the test showed that the filters were efficient.

Typhoid Fever Outbreak.

For the purposes of this report the description of the typhoid fever outbreak will be confined chiefly to the district comprised by the three Pennsylvania boroughs of Athens, Sayre, and South Waverly. The outbreak which occurred at the same time in Waverly Village, New York State, will be dealt with only in so far as it relates to the outbreak in Pennsylvania.

Investigation has shown that reports of typhoid fever cases in the district are far from being satisfactory for the years prior to 1911. From the best records obtainable, however, it is evident that typhoid fever has been more or less endemic in parts of the district. The best records obtained relate to the prevalence of the disease in Athens and Sayre. The reports from South Waverly begin with 1909.

Below is shown a tabulation of the occurrence of typhoid fever in the district from 1905 to 1911 inclusive, so far as the records could be secured. From these figures it appears that the total number of cases in 1911 is not comparatively excessive, it having been exceeded in at least four previous years, in which years it is presumed that the records were not kept as carefully as they probably are at the present time. During the year 1904 there was an epidemic of typhoid fever in Sayre. Detailed records of this outbreak were not kept; but it is reported that there were over 100 cases of the fever. There is no evidence that either of the other two boroughs ever had an epidemic of typhoid fever. The table is as follows:

Monthly and Yearly Record—Typhoid Fever Cases—Compiled From Borough and State Records.

Name of Borough	Month.												Yearly total.	
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Borough.	District.
1905														
Athens,	*	*	*	*	*	*	*	*	*	*	1	2	3	....
Sayre,	3	2	15	10	1	2	10	12	3	9	3	9	79	....
S. Waverly,	*	*	*	*	*	*	*	*	*	*	*	*	*	....
Dist. total monthly,	3	2	15	10	1	2	10	12	3	9	4	11	82	82
1906														
Athens,	2	0	2	0	3	0	2	2	1	1	1	1	15	....
Sayre,	11	10	3	7	7	0	2	5	1	2	8	4	60	....
S. Waverly,	*	*	*	*	*	*	*	*	*	*	*	*	*	....
Dist. total monthly,	13	10	5	7	10	0	4	7	2	3	9	5	75	75
1907														
Athens,	1	3	0	2	0	1	0	0	3	6	4	4	24	....
Sayre,	10	10	1	....	1	1	0	....	0	0	0	2	25	....
S. Waverly,	*	*	*	*	*	*	*	*	*	*	*	*	*	....
Dist. total monthly,	11	13	1	2	1	2	0	0	3	6	4	6	49	49
1908														
Athens,	0	1	1	1	0	1	0	3	0	4	1	0	12	....
Sayre,	3	0	0	0	0	1	2	1	2	2	0	2	13	....
S. Waverly,	*	*	*	*	*	*	*	*	*	*	*	*	*	....
Dist. total monthly,	3	1	1	1	0	2	2	4	2	6	1	2	25	25
1909														
Athens,	1	0	1	1	2	2	0	4	1	0	0	0	12	....
Sayre,	1	8	7	6	7	2	1	0	3	2	0	2	39	....
S. Waverly,	*	*	*	*	*	*	*	*	*	*	*	*	*	....
Dist. total monthly,	2	8	8	7	9	4	1	4	4	2	0	2	51	51
1910														
Athens,	1	0	1	2	4	0	0	0	0	2	0	0	10	....
Sayre,	0	0	*	*	0	*	*	*	*	*	0	0	....	....
S. Waverly,	*	*	*	*	*	*	*	*	*	*	*	*	*	....
Dist. total monthly,	1	0	1	2	4	....	....	....	....	2	0	0	10	10
1911														
Athens,	0	0	0	0	0	0	4	4	3	0	0	0	11	....
Sayre,	0	0	0	3	0	0	7	10	5	0	0	1	26	....
S. Waverly,	0	0	0	0	0	0	4	4	3	0	0	0	11	....
Dist. total monthly,	0	0	0	3	0	0	15	18	11	0	0	1	48	48

*No report.

The following table shows the comparison of the cases of typhoid fever occurring during July, August and September, 1911, with those of same months of former years.

Monthly Record for July, August and September, 1911.

Name of Borough.	1905.			1906.			1907.			1908.		
	July.	August.	September.	July.	August.	September.	July.	August.	September.	July.	August.	September.
Athens,	*	*	*	2	2	1	0	0	3	0	3	0
Sayre,	10	12	3	2	5	1	0	....	0	2	1	2
S. Waverly,	*	*	*	*	*	*	*	*	*	0	0	0
Total,	10	12	3	4	7	2	0	0	3	2	4	2

*No report.

Name of Borough.	1909.			1910.			1911.		
	July.	August.	September.	July.	August.	September.	July.	August.	September.
Athens,	0	4	1	0	0	0	4	4	3
Sayre,	1	0	3	*	*	*	7	10	5
S. Waverly,	0	0	0	0	0	0	4	4	3
Total,	1	4	4	0	0	0	15	18	11

*No report.

The investigation conducted by the Department extended over a period of four days, from August 16th to August 19th inclusive. During this time a census was made of all the cases occurring during July and during August up to the date of departure from Sayre, namely, August 19th. In all, thirty-two cases were investigated. One additional case occurred in August after the 19th, and eleven cases during the month of September. Detailed data has been secured concerning the 32 cases only, and from this information any conclusions which may have been arrived at as to the cause of the outbreak have been deduced. The following table shows in detail the pertinent facts collected concerning each of the 32 cases, of which 8 were located in Athens, 15 in Sayre, and 9 in South Waverly:

DIGEST OF TYPHOID FEVER CASES.

	Name.	Address.	Age.	Sex.	M. S. W.	Occupation.	Date of onset.	Nursed.	Pop. in house.	Other cases in house.	Sanitary condition.	Sewer conn.	Disp. of excreta.	Toilet facilities.	Water Supply.		Shell fish.	Milk supply.	Ice cream.	Ice.	Remarks.
															Home.	Other.					
		ATHENS.																			
1	Lawrence R. Kendall,	132 Willow St.,	23	M	S	Telegraph operator,	7-18	Home (mother),	4	0	Good,	No.	Buried,	Cesspool,	Public,	Miscellaneous,	No	Smith Creamery,	Mingo's,	No	Visited, May 30, Warren, Pa., Buffalo, Niagara Falls. Used local water. Drinks much milk.
2	Agatha Buckley,	736 S. Main St.,	3	F	S	Infant,	7-19	Home (nurse,	4	0	Good,	Yes.	Sewer,	Sewer,	Public,	No,	No	Condensed,	No,	Yes	Used no sweet milk, used butter milk and cottage cheese (Waverly Creamery) French (Pedlar) father No. 4.
3	Attie Clafflin,	217 North St.,	13	F	S	Student,	7-22	Nurse,	4	0	Good,	No.	Buried,	Cesspool,	Well,	No,	No	Birney,	Waverly Creamery,	Yes	Ailing for 2 years. Ice-cream from French.
4	Helen French,	203 Satterlee St.,	3	F	S	Infant,	7-23	Home (mother),	4	0	Fair,	No.	Buried,	Cesspool,	Well,	Public,	No	Dalrymple, Birney, Waverly Creamery.	Waverly Creamery,	No	Visited Waverly 6-26. Used public water. Her father is French (Pedlar) for Waverly Creamery, to 7-15.
5	Mary A. Thurston,	207 Chestnut St.,	62	F	W	Housekeeper,	7-27	Home (daughter),	7	2	Fair,	No.	Privy,	Cesspool,	Public,	Well,	No	Unknown,	Unknown,	No	Imported, secondary. Lived at Waverly with Mr. and Mrs. Jones. Both typhoid patients. Nursed Mrs. Jones.
6	Elton Brennan,	219 Bridge St.,	14	M	S	Student,	7-31	Home (nurse),	3	0	Fair,	No.	Buried,	Cesspool,	Well,	No,	No	Coleman,	Kimmich Co.,	No	Worked for Middaugh (milk dealer) to 7-22. Camped Watkins Glen from 7-22. Swam in Chemung.
7	Mrs. Maud Page,	107 E. Orchard St.,	38	F	W	Housewife,	8-2	Home (nurse),	2	0	Good,	No.	Cesspool,	Cesspool,	Public,	Miscellaneous,	No	Middaugh,	Unknown,	No	Visited Buffalo prior to onset.
8	Frank Wattels,	211 Center St.,	9	M	S	Student,	8-12	Home (mother),	5	0	Fair,	No.	Buried,	Cesspool,	Well,	Miscellaneous,	No	Smith Creamery,	No,	No	Used miscellaneous water. Town well and Stm. Laund. Well in Athens. Public and D. L. & W. station. Well at Waverly.
		SAYRE.																			
1	Elizabeth Booth,	Desmond St.,	16	F	S	Visitor,	7-17	Home of sister,	4	0	Fair,	Yes.	Sewer,	Sewer,	Public,	Miscellaneous,	No	No,	Unknown,	No	Patient came from Forty-Fort, Pa., to visit sister. Ailing on arrival.
2	Winnie Wheatley,	140 S. Hopkins St.,	17	F	S	Student,	7-19	Home, Hospital, 7-23,	6	1	Good,	No. (Yes)	Sewer,	Sewer,	Public,	No,	No	Gage, Norris & Co.,	Titus (Waverly Creamery),	No	Sister also sick. She had been ailing all spring. Taken to People's Hospital, 7-23.
3	Pearl Wheatley,	140 S. Hopkins St.,	23	F	S	Seamstress,	7-19	Hospital, 7-23,	6	1	Good,	Yes.	Sewer,	Sewer,	Public,	No,	No	Gage, Norris & Co.,	Titus (Waverly Creamery),	No	Sister also sick. This patient ailing all spring. Taken to People's Hospital, 7-23.
4	Ellen Sinsabaugh,	202 Mill St.,	12	F	S	Student,	7-19	Home (mother),	7	0	Fair,	No.	Buried,	Cesspool,	Public,	Well,	No	Dalrymple, Miller,	Titus (Waverly Creamery),	No	Used McCabe's well. Drilled 96 ft. deep.
5	Mrs. L. G. Colver,	210 S. River St.,	42	F	M	Housewife,	7-27	Hospital, 7-27,	6	1	Fair,	Yes.	Sewer,	Sewer,	Public,	No,	No	White, condensed,	Cook's (Elmira),	Yes	Secondary? Nursed a son ill with typhoid fever.
6	Robert Nusbaum,	811 N. Elmer St.,	9	M	S	At home,	7-29	Home (mother),	6	0	Good,	No.	Cesspool,	Privy,	City,	No,	No	Waverly Creamery,	Waverly Creamery,	No	
7	Mrs. J. C. McCracken,	120 Center St.,	21	F	M	Housewife,	7-29	Home (nurse,	3	1	Good,	No,	Buried,	Cesspool,	Public,	Well,	No	Dalrymple,	Titus,	No	Used Champion's drilled-well. This woman's husband helped nurse her. Took typhoid, 8-3.
8	Winifred Watts,	503 N. Elmer St.,	22	F	M	Housewife,	7-31	Home (nurse),	5	0	Good,	No.	Buried,	Cesspool,	Public,	No,	No	Dalrymple,	Raymond's,	No	Ailing all summer and under doctor's care.
9	August Paul,	207 S. Thomas St.,	26	M	M	Laborer,	7-29	Hospital, 8-3,	6	0	Fair,	No.	Cesspool,	Cesspool,	Well,	City,	No	White,	Waverly Creamery,	No	Used Aug. Paul well. Drilled, 28 ft. deep.
10	Genevieve Martin,	821 N. Elmer St.,	4	F	S	Infant,	7-31	Home (mother),	7	1	Good,	No.	Cesspool,	Cesspool,	Public,	No,	No	Waverly Creamery,	Waverly Creamery,	No	Sister also ill with typhoid. Onset same date.
11	Vivian Martin,	821 N. Elmer St.,	13	F	S	Student,	7-31	Home (mother),	7	1	Good,	No.	Cesspool,	Cesspool,	Public,	Miscellaneous,	No	Waverly Creamery,	Waverly Creamery,	No	Sister also ill with typhoid. Onset same date. Patient visited Towanda within 30 days.
12	Albert R. Titus,	208 S. Keystone St.,	4	M	S	Infant,	7-31	Home (father) (mother),	6	1	Good,	No.	Buried,	Cesspool,	Public,	No,	No	Middaugh,	Waverly Creamery,	Yes	This case in combined store and dwelling. Father tends store. Sells Waverly Creamery products. Helped nurse sister with typhoid, Mildred, Pa.
13	J. C. McCracken,	120 Center St.,	33	M	M	Engineer,	8-3	Home (nurse),	3	1	Good,	No.	Cesspool,	Cesspool,	Public,	Miscellaneous,	No	Dalrymple,	Titus,	No	Secondary? Wife had fever 7-29. Helped nurse her. Used miscellaneous water supply at work.
14	Ruth Jordan,	114 Center St.,	15	F	S	Student,	8-7	Home,	6	0	Good,	No.	Buried,	Cesspool,	Public,	No,	No	Dalrymple,	Titus,	No	
15	Martha Bounds,	112 Center St.,	55	F	M	Housewife,	8-10	Hospital, 8-15,	3	0	Good,	No.	Cesspool,	Cesspool,	Well,	No,	No	Dalrymple,	Unknown,	No	Round's well drilled 62 ft deep used.
		SOUTH WAVERLY.																			
1	Chas. Gustinos,	Pleasant St.,	16	M	S	Factory,	7-18	Home (mother),	10	0	Fair,	No.	Buried,	Privy,	Public,	Well,	No	Edgecomb, Waverly Creamery,	Cretsus (Wav. Crmy.) (Lackaris),	No	Used water (Curry's well. Novelty Works supply.) Swam in Susquehanna river prior to illness.
2	Gertrude Ashton,	Lafayette St.,	21	F	S	Music teacher,	7-27	Home (mother),	5	2	Good,	No.	Cesspool,	Cesspool,	Well,	Miscellaneous,	No	Mrs. Moore,	Kimmich Co.,	No	2 other cases in house. Onset 7-30 and 8-3. Probably drank miscellaneous water supply at work.
3	Margaretta Ashton,	Lafayette St.,	15	F	S	Student,	7-30	Home (mother),	5	2	Good,	No.	Cesspool,	Cesspool,	Well,	Public,	No	Mrs. Moore,	Unknown,	No	2 other cases in house. Onsets 7-27 and 8-3. Driven well at home suspicious.
4	Wallace L. Stedge,	228 Bradford St.,	12	M	S	Student,	8-1	Home (mother),	4	0	Fair,	No.	Privy,	Privy,	Public,	No,	No	Edgecomb,	Cretsus,	No	Taken ill at Waverly, N. Y.
5	Earl Payne,	Pleasant St.,	14	M	S	Clerk,	8-1	Home, hospital, 8-12,	7	0	Good,	No.	Buried,	Cesspool,	Well,	Public,	No	Haight, Waverly Creamery,	Cretsus,	No	Dug well at Payne's is home water supply. Swam in Susquehanna river prior to illness.
6	Willis Ashton,	Lafayette St.,	16	M	S	Student,	8-3	Home (mother),	5	2	Good,	No.	Cesspool,	Cesspool,	Well,	No,	No	Mrs. Moore,	Kimmich Co.,	No	2 other cases in house. Onsets 7-27 and 7-30. This and one of the other cases may be secondary.
7	Nellie Kane,	43 Pleasant St.,	21	F	S	Weaver,	8-5	Home (nurse),	5	0	Good,	Yes.	Privy,	Sewer,	Public,	Miscellaneous,	No	Shipman,	Turnors,	Dodge	Imported. Came from Sidney, N. Y., about 7-3. Used Shipman milk 2 months prior to illness.
8	Frank Parenti,	21 William St.,	6	M	S	Student,	8-13	Home (mother),	6	0	Fair,	No.	Buried,	Privy,	Public,	No,	No	Waverly Creamery,	No,	No	
9	Mrs. Edw. Sickler,	54 Pitney St.,	25	F	M	Housewife,	8-14	Home (husband),	4	0	Good,	No.	Cesspool,	Cesspool,	Public,	Well,	No	Shipman, Waverly Creamery,	Ice cream sodas,	No	Drank much Shipman milk.

The cases as divided with respect to sex were as follows:

Location.	Male.	Female.	Total.
Athens,	2	6	8
Sayre,	4	11	15
S. Waverly,	5	4	9
Total,	11	21	32

The age of the patients is shown in the following tabulation, which also shows the age with respect to sex:

Ages. Years.	Athens.			Sayre.			South Waverly.			Total for District.		
	Male.	Female.	Total.	Male.	Female.	Total.	Male.	Female.	Total.	Male.	Female.	Total.
0- 4,	......	2	2	1	1	2	......	......	......	1	3	4
5- 9,	......	1	1	1	......	1	1	......	1	2	1	3
10-14,	1	1	2	......	2	2	2	......	2	3	3	6
15-19,	......	......	......	......	3	3	2	1	3	2	4	6
20-24,	1	......	1	......	3	3	......	2	2	1	5	6
25-29,	......	......	......	1	......	1	......	1	1	1	1	2
30-34,	......	......	......	1	......	1	......	......	......	1	......	1
35-39,	......	1	1	......	......	......	......	......	......	......	1	1
40-44,	......	......	......	......	1	1	......	......	......	......	1	1
45-49,	......	......	......	......	......	......	......	......	......	......	......	......
50-54,	......	......	......	......	......	......	......	......	......	......	......	......
55-59,	......	......	......	......	1	1	......	......	......	......	1	1
60-64,	......	1	1	......	......	......	......	......	......	......	1	1
Total,	2	6	8	4	11	15	5	4	9	11	21	32

The various occupations, as shown in the following table, indicate that at least 75 per cent. of the patients were infants, students, housewives or persons residing at home, or a total of 24 out of 32 fall under this list. The detailed table is as follows:

Occupation.	Athens.	Sayre.	S. Waverly.	Total.
Infant,	2	2	....	4
Telegraph Op.,	1	....	....	1
Student,	3	4	4	11
Housewife,	2	4	1	7
Dressmaker,	....	1	....	1
Laborer,	....	1	....	1
Engineer,	....	1	....	1
Factory hand,	....	....	1	1
Music Teacher,	....	....	1	1
Clerk,	....	....	1	1
Weaver,	....	....	1	1
At Home,	....	2	....	2
Total,	8	15	9	32

With respect to the onset of the disease, the date of the physician's first visit was accepted since this appears to be the only definite date that could be secured, the dates when the patients first felt ill showing a wide variation, and in several cases being only approximate. On this basis the dates of onset were as set forth in the following table:

Date.	Athens.	Sayre.	S. Waverly	Total.
July 17,	....	1	....	1
July 18,	1	....	1	2
July 19,	1	3	....	4
July 22,	1	....	....	1
July 23,	1	....	....	1
July 27,	1	1	1	3
July 29,	....	3	....	3
July 30,	....	....	1	1
July 31,	1	4	....	5
August 1,	....	....	2	2
August 2,	1	....	....	1
August 3,	....	1	1	2
August 5,	....	....	1	1
August 7,	....	1	....	1
August 10,	....	1	....	1
August 12,	1	....	....	1
August 13,	....	....	1	1
August 14,	....	....	1	1
Total,	8	15	9	**32**

Out of the total of 32 cases one patient only was definitely known to have used shell fish within thirty days prior to his illness. Five of the patients had used ice, four of the manufactured variety, and one an ice supply secured from a natural source.

There were 15 known and 2 unknown milk supplies involved in the 32 cases. Included in this number were 3 large creameries, namely: The Smith (Tioga) Creamery and the Dalrymple Creamery located in Athens, and the Waverly Creamery located in Waverly Village. These are all large dealers. The other dealers who do a considerable business are Kimmich Company, and Gage Norris & Company in Sayre, and the Shipman Dairy in Waverly.

The Tioga Creamery handles a maximum of 900 quarts of milk and cream daily. It supplies a local trade in Athens and Sayre, and serves milk in bottles and from the can. Cream from this establishment is shipped to Milan, Pennsylvania. The supply is obtained from nine dairies located in Pennsylvania within a radius of five miles of Athens. The milk is not pasteurized but is merely cooled and bottled. The bottles are washed, not sterilized, and capped by hand. The ice used is of the artificial variety. Two of the patients only, these residing in Athens, used this supply.

The Dalrymple Creamery with an average output of 1,500 quarts daily, of which amount 500 quarts are served to local trade in Athens and Sayre and about 1,000 quarts shipped to Jersey City and Long Island, obtains its supply from 21 dairies, all in Pennsylvania and located within a five mile radius of Athens. The cream at this plant is secured from a branch of the concern located at New Albany, Pennsylvania, and also from Stevenson's cold storage house located a short distance north of Sayre. All of the shipped goods is bottled, as is the majority of the local trade. About 150 quarts daily are served locally from the can. The milk is cooled but not pasteurized. The bottles are washed with soap and hot water but are not sterilized. In cooling the milk it is placed in the large cans which are then set in a tank filled with ice which is brought up around the neck of the cans from which the stoppers have been removed. The bottled milk is put in cases, capped by hand, and broken ice is then piled on top. The ice supply is obtained from the Chemung river near Athens, above which point the sewage from the City of Elmira is discharged into the stream. On the date of the Department's inspection the sanitary conditions around the plant and the method of handling the milk and cream were not to be particularly commended. The stoppers used in the filling tank, after their removal, were laid about the room on boxes near the floor. Seven of the patients used this milk supply, one in Athens and six in Sayre.

The Waverly Creamery Company, located in Waverly village, has a local trade in Waverly, South Waverly and a portion of Sayre. In August, 1911, this Company was serving in Sayre 222 customers and in South Waverly 45 customers among whom were distributed in the neighborhood of 300 quarts of milk daily, all in bottles. The total output of the Creamery is 800 quarts daily, supplied by from ten to twelve farmers residing in New York State near Waverly. The milk is collected from the country side, all mixed in a receiving tank, the morning and evening milk being kept separate, and pasteurized at a temperature of 155 degrees Fahrenheit. It is then bottled, capped, placed in cases and stored in the refrigerator. Steam is used in sterilizing the bottles. The ice supply is secured from a local dealer and is harvested from Dodge's Pond near Waverly.

The Waverly Creamery Company, in addition to its milk trade, makes ice-cream, which is sold locally and also through dealers in Athens and Sayre, and during the summer months at the Keystone Park near Sayre. The principal dealers in this article at Sayre are a grocer named Titus and a confectionery store conducted by Tony Archy. In Athens the product is peddled about the streets. In Waverly the Creamery Company itself handles the product and a considerable amount is also dispensed at a confectionery store owned by a Greek by the name of Cretsus.

From an inspection of the premises at the Waverly Creamery it was apparent that an effort was being made to handle the products in a more sanitary fashion. The creamery, however, at the time was unscreened and flies were very numerous where the milk was being bottled and where the ice-cream was made. Nine of the patients used milk from this creamery; one in Athens, three in Sayre and five in South Waverly.

From the subjoined table, in which is shown in detail the milk supply for all of the cases, it appears that the Waverly Creamery Company and the Dalrymple Creamery Company supplied half of the number of cases, either wholly or in part, the rest of the patients securing milk from a number of other sources.

Name of Dealer.	Athens.				Sayre.				South Waverly.				Total.		Total.
	Regular.		Other.		Regular.		Other.		Regular.		Other.				
	Bot.	Can.	Bot.	Can.	Bot.	Can.	Bot.	Can.	Bot.	Can.	Bot.	Can.	Bot.	Can.	
Smith Creamery, Tioga, (Athens),	2	......	......	......	......	......	......	......	......	......	......	......	2	......	2
Birney, (Athens),	......	2	......	......	......	......	......	......	......	......	......	......	......	2	2
Dalrymple Creamery, (Athens),	1	......	......	......	6	......	......	......	......	......	......	......	7	......	7
Coleman, (Athens),	......	1	......	......	......	......	......	......	......	......	......	......	......	1	1
Middaugh, (Athens),	1	......	......	......	1	......	......	......	......	......	......	......	2	......	2
Brainard, (Athens),	......	......	......	......	......	1	......	......	......	......	......	......	......	1	1
Gage, Norris and Co., (Sayre),	......	......	......	......	......	2	......	......	......	......	......	......	......	2	2
White, (Sayre),	......	......	......	......	1	1	......	......	......	......	......	......	1	1	2
Weed Miller, (Sayre),	......	......	......	......	......	......	......	1	......	......	......	......	......	1	1
Mrs. Moore, (S. Waverly),	......	......	......	......	......	......	......	......	......	3	......	......	......	3	3
Edgecomb, (S. Waverly),	......	......	......	......	......	......	......	......	1	......	1	......	2	......	2
Waverly Creamery, (Waverly),	......	......	1	......	3	......	......	......	3	1	1	......	8	1	9
Shipman, (Waverly,	......	......	......	......	......	......	......	......	1	1	......	......	1	1	2
Haight, (Waverly),	......	......	......	......	......	......	......	......	1	......	......	......	1	......	1
Condensed,	1	......	......	......	......	......	1	......	......	......	......	......	2	......	2
Unknown,	1	......	......	......	1	......	......	......	......	......	......	......	2	......	2
Total supplies, 16;	6	3	1	......	12	4	1	1	6	5	2	......	28	13	41

Summarized, the supplies were distributed as follows:

4 Supplies served 1 Case only,	4 Supplies.
9 Supplies served 2 Cases each,	18 Supplies.
1 Supplies served 3 Cases each,	3 Supplies.
1 Supplies served 7 Cases each,	7 Supplies.
1 Supplies served 9 Cases each,	9 Supplies.
16	41

The detailed facts relative to the use of ice-cream by the typhoid fever patients in the district, are shown in the following table:

Supply.	Athens.	Sayre.	S. Waverly	Total.
Waverly Creamery, (Direct),	1	2		3
Waverly Creamery, (Titus),		9		9
Cretsus, (Waverly Creamery and (Lackaris-Elmira),			3	3
Raymond, (Sayre),		1		1
Cook's, (Elmira, Supply unknown),		1		1
Kimmich Co., (Sayre),			2	2
Turner's, (Waverly),			1	1
Miscellaneous,			1	1
Total using ice cream,	1	13	7	21
Total cases,	8	15	9	32

Generally speaking the cases were scattered through individual houses, 75 per cent. of the total number of cases being thus located. Following, herewith, is the tabluation of the cases with respect to their location:

	Athens.	Sayre.	S. Waverly.	Total Houses.	No. Cases.
No. of houses with one case,	8	9	6	23	23
No. of houses with two cases,		3		3	6
No. of houses with three cases,			1	1	3
Total,				27	32

As the outbreak occurred during the season of the year when the infection might be transmitted through the medium of flies, it is of interest to note the location of cases. In Athens 4 out of the total of 8 cases were located within 1,000 feet of each other, the balance of the cases in Athens being widely scattered. Of the four referred to, one case was imported from Waverly. The onsets in the case of the other 3 vary from 9 to 21 days from the date of the first to the date of the last case, coming down at the latest date. In South Waverly there are two facts significant with respect to grouping of cases. Cases No. 1 and No. 5 lived on opposite sides of the same street. The onset of the first case occurred fourteen days prior to that of the second. The two patients were boys who played together and both swam in the Susquehanna River prior to their illness, at a point below the outfall sewer from Waverly. The other significant fact relates to the three cases in the Ashton family, with dates of onset July 27th, July 30th and August 3rd, respectively. It is quite probable that one or more of these cases was of secondary origin.

In Sayre there were seven cases in two groups as respects location. The first group comprised three cases in adjacent houses, two of which were in one house. The second group comprised four cases in three houses, adjacent or within several hundred feet of each other. As regards the second grouping there were also distant from these cases a maximum of 1,200 feet three other cases in two houses. One of the cases in the second group can be quite definitely charged to secondary origin. The onsets in the case of the first group varied from one to two days; while in the second group fourteen days elapsed between the date of the first case and the date of the last case, and the two cases occurring in a house within 600 feet of this group had onsets at least a week prior to the date on which the first case of this group came down. There could be no connection between the first and second groups, as they were located at least one-half mile distant from each other.

Generally at patients' houses the toilet facilities involved the use of a cesspool on the premises. This method of sewage disposal is quite common, the ground being quite well adapted to it.

In Athens, one case at least, namely, No. 5, was imported from Waverly and was probably a case of secondary infection as the patient had helped nurse typhoid fever patients at her home in Waverly. In Sayre case No. 1 was imported. Case No. 5 was a patient who had nursed a son ill with typhoid fever and was probably a secondary infection. Cases Nos. 2 and 3 resided in the same household. One may have been secondary. Case No. 13 was a patient who had nursed his wife, she being ill with typhoid fever, and this also was probably a secondary infection. In other words, probably four out of a total of fifteen cases in Sayre were either imported or of secondary infection. In South Waverly there is a possibility that Case No. 8 was imported. Cases Nos. 2, 3 and 6 were in one household, and one or two of them may have been of secondary infection.

Of the thirty-two cases, ten used the public water supply only; nine the supply furnished by the Sayre Water Company, and one that furnished by the Waverly Water Company. Four patients used well water only. Eleven used the public supply and that derived from various wells. Seven patients used a miscellaneous supply, both local and in other places. The following table shows these figures in detail separated as to communities:

Supplies.	Athens.	Sayre.	S. Waverly.	Total.	Sayre and Athens Public.	Waverly Public.	Total.
Public only,	1	8	1	10	9	1	10
Well only,	2	....	2	4	....	....	4
Public and well,	2	4	5	11	5	6	11
Public and miscellaneous,	2	3	1	6	....	....	....
Well and miscellaneous,	1	....	....	1	....	....	....
Used Athens, Sayre, Waverly and Warren, Buffalo, Niagara Falls, Forty Fort public,	....	....	....	....	....	....	7
Total cases,	8	15	9	32	....	....	32

As a matter of interest it may be noted that at the same time of the typhoid fever outbreak in Athens, Sayre, and South Waverly, there was an outbreak of the fever in the adjacent municipality of Waverly Village, New York State. From July 11th to August 3rd inclusive, there were 19 cases in Waverly, divided almost equally as relates to sex. Here also, as in the districts of Pennsylvania hereinbefore described, housewives and students predominated among the persons ill with the disease, making a total of 11 out of 19 cases, the other 8 following various callings. 14 out of the 19 cases were under thirty years of age. 10 of the 19 had used ice-cream made by the Waverly Creamery Company.

The outbreak in Waverly was investigated by officials of the New York State Board of Health, and a theory as to the cause of the infection was formulated. This outbreak was not investigated in detail by the Pennsylvania Department of Health representatives, except as to its bearing upon the outbreak occurring at the same time in the Pennsylvania boroughs adjoining. A census of the 19 cases, however, shows that almost half of the patients secured milk either wholly or in part from a local dealer named Shipman. It was ascertained that this dealer supplied milk in bottles to a house in Waverly in which a person died about July 4th of a disease which the physicians thought was typhoid fever, although the diagnosis was not positive. A neighbor of the deceased came down with typhoid fever after he had helped nurse the patient. He also was supplied with milk by Shipman in bottles. It is believed by the Waverly Health officials that the infection was brought into the Shipman milk depot by means of infected milk bottles returned to the dealer and thence transmitted to other homes. So far as is known, only two of the patients in the Pennsylvania district, these residing in South Waverly, at any time used the Shipman milk.

During the investigation, samples of water were collected by the Pennsylvania Department of Health representatives from the various sources of water supply of the patients in the district. These, upon analysis at the Department's laboratories, showed the following results:

The first are samples collected at Athens, August 16, 1911:

August 16, 1911.	Total Bac. per c. c.	B. Coli per c. c.
No. 1. Town pump,	1200	0
No. 2 Well, T. A. Brennan,	1000	0
No. 3 Well, C. E. Clafflin,	560	0
No. 4 Well, A. E. Bressler,	40	1

Samples Collected August 18, 1911.	Total Bac. per c. c.	B. Coli per c. c.
No. 1—Waverly Water Co., (S. Waverly Supply), Main Stream (Dry Brook) 1000 feet above Upper Res.,	120	0
No. 2—Curry's Well, (Waverly) Supply for Novelty Works,	12	0
No. 3—Well at Payne's Residence, (S. Waverly),	2	0
No. 4—Well at Ashton's, (S. Waverly),	6	0
No. 5—Tap, Waverly Public Supply, Residence of Northrups, (South Waverly),	10	0
No. 6—Driven Well, E. Northrup's, (S. Waverly),	3	0
No. 7—Drilled Well, Humphrey Rounds, (Sayre),	48	0
No. 8—Drilled well, Edward Champions, (Sayre),	2	0
No. 9—Drilled Well, D. J. McCabe, (Sayre),	3	0
No. 10—Drilled well, Aug. Paul, (Sayre),	30	0
No. 11—Tap, Wilbur House, (Sayre),	4	0
No. 12—Spring, Wm. Vorhees, (Sayre),	2	0

In addition to the above, samples were collected from the Waverly public supply by the Waverly Water Company and analyzed by Nelson and Lauder, Chemists, of Binghampton, N. Y., the results of said analysis following: Collected at Croll's Cafe, Waverly, N. Y. at 3:30 P. M.

Samples Received.	July 10, 1911.	July 31, 1911.	August 8, 1911.
Turbidity,	3	none	absent
Alkalinity,	23	25	27
Bacteria per c. c.,	65	58	55
Gas formation,	absent	absent	absent
Bacteria at blood heat,	4	9	12
Indole formation,	absent	absent	absent
Acid formers,	absent	absent	absent
Int. or Sewage Bacteria,	absent	absent	absent

Reference has already been made to the samples of the Sayre and Athens public water supply as appearing in the appended report, of a test conducted at the Sayre Water Company Filter Plant.

Discussion.

An analysis of the facts gathered respecting the typhoid fever outbreak in the district, fails to reveal any very definite cause therefor. One of the principal reasons for this is due to the limited number of cases involved. There are, however, several significant features; first of which may be mentioned the water supply. One-third of the total cases used either wholly or in part, well water. Disposal of sewage from households into cesspools is quite common in the district, these cesspools often being in rather close proximity to wells which are used as sources of domestic water supply. There are said to be over 100 individual wells in use in the borough of Sayre alone. About fifteen feet below the surface of the ground there is an impervious layer of hard pan which controls the level of the underground water table. In 1906 there were approximately 1,000 cesspools in use in Sayre. The people have been warned by the State and local authorities of the danger assumed in drinking well water under the existing conditions.

Another distinct feature is that the number of cases of typhoid fever in the district during 1911 is not excessive when compared with previous years. The marked point in this year is that 44 out of 48 cases occurred in July, August and September, which rate is higher for these three months than for previous years. It is to be remembered, however, that for former years the reports of cases were unsatisfactory and incomplete. Possibly if complete reports could be obtained for previous years this marked feature of the year 1911 might not be so significant.

From the facts gathered it appears that the sources of infection cannot be traced to ice or shell fish. There is a probability that the infection was transmitted in certain localities, both in Sayre and Athens, through the medium of flies.

The ice-cream supply of the Waverly Creamery Company appears quite often in the list of cases. This, however, is natural, as this concern is a large dealer in the territory. A notable feature of the outbreak in Sayre, however, as relates to ice-cream, is that 9 out of 15 patients secured their ice-cream from a small store owned by a man named Titus. At this store an infant son of Mr. Titus was ill with typhoid fever in the house which was connected with the store-room. It is a known fact that Mr. Titus visited the sick room in addition to attending to his duties in the store, and it is reasonable to suppose that he helped with the nursing. Furthermore, another child of Mr. Titus was taken sick with typhoid fever at Mildred, Sullivan County, Pennsylvania, and she had been ailing before leaving home, her departure having taken place a short time before the typhoid fever outbreak. It is therefore seen that infection might easily have been transmitted to possibly half of the patients in Sayre through the medium of ice-cream sold at this store.

Accepting this theory and adding to these cases, nine in number, the imported and secondary cases where these have been reasonably established, there being six of such, it appears that of the total of 32 cases, at least 15 may be concluded as being accounted for in this fashion. Dividing the remainder of the cases between the two months, July and August, the rate is not particularly excessive over that of previous years.

No direct evidence can be adduced showing that any one of the 16 milk supplies involved has been the source of infection of any large number of cases. As is natural, the majority of the cases appear on the routes of the large dealers, but this is no conclusive evidence at all that milk was the source of the trouble. If the theory of the Waverly health authorities is accepted, then possibly two of the cases in South Waverly may have resulted from infected milk supply served by Shipman.

The public water supplies do not appear to be at fault, either from investigation of the physical conditions relating thereto, or from a perusal of the analyses of water samples collected at various points on the systems.

The only conclusion which it seems can reasonably be arrived at is that this was a sporadic outbreak which cannot be definitely assigned to any direct cause, and may have been caused by one or several sources of infection. The lesson to be pointed out to the communities as drawn from the outbreak, is the necessity of a more rigid supervision of the milk supplies and the discontinuance of the use of shallow wells in close proximity to cesspools.

21. TYPHOID AT AUSTIN.

On October 26th, 1907 the borough of Austin, Potter, County, Pennsylvania, made application for permission to obtain an additional water supply from Dirches Spring and from drilled wells. The Borough had received a decree relative to water-works issued by the Commissioner of Health on June 27th, 1906 containing nine stipulations, most of which had not been complied with on October 26th, 1907, and without complying with these stipulations and in further defiance of State law, the local authorities proceeded during the season of 1908 not only to obtain the additional source mentioned in the application of October 26th, 1907, but to obtain other sources and to make other extensions and alterations to water works system without application for or a written permit from the Commissioner of Health. These authorities evinced a purpose to avoid the fulfillment of the terms of the decree of 1906 and proceeded without the advice of the Department until the outbreak of typhoid fever during the early winter of 1910. The conditions with respect to the water works system in the borough were investigated by the Department early in 1911 and a report was made by Mr. William E. Ennis, Assistant Engineer, of his field investigations. His report was the basis for the following discussion and decree issued by the Commissioner of Health on May

10th, 1911. It was on September 30th of this year that the dam hereinafter mentioned collapsed resulting in the destruction of the town and a large loss of life. The description of water works and statement of facts, all relating to circumstances existing on or before May 10th, 1911, follow:

General Conditions.

Austin Borough is a substantial, residential and industrial community located at the fork of Freeman's Creek and its west branch in the southwestern part of Potter County, about nine miles south of Coudersport, the county seat of government. The population of the borough is about three thousand; in nineteen hundred it was twenty-three hundred and in eighteen hundred and ninety it was sixteen hundred and seventy-nine. The incorporated territory comprises about fourteen hundred acres and is bounded on the north by Keating Township, on the west and south by Portage Township and on the east by Sylvania Township.

The Buffalo and Susquehanna Railroad extending from the Erie Division of the Pennsylvania Railroad at Keating Summit to Buffalo, N. Y., passes diagonally through the southern part of the borough. The borough is supported financially, chiefly by lumber industries, the forests in the vicinity have been cut and timber is now brought in from a distance. The principal industrial establishments are the Goodyear Lumber Company, employing 100 hands, the Bayless Pulp and Paper Company employing 300 hands, Emporium Lumber Company and the Standard Wood Company giving employment to 125 and 75 hands respectively.

The business part of the town is along Main Street, which extends westward through about the centre of the municipal territory north of the west branch of Freeman's Creek. Extending north and nearly at right angle from Main Street are Orchard, Turner, Railroad and Rucaber Streets. Rucaber Street extends out into Keating Township, paralleling Freeman's Creek on the east. Elliott and Shea Streets are at right angle to Rucaber Street and north of Main Street. Costello Avenue parallels the east bank of Freeman's Creek south of Main Street. To the east of Costello Avenue and in order named are School, Schoville and High Streets. To the south of the west branch of Freenman's Creek and parallel to it are Thorne and Foster Streets. Along these highways which traverse approximately one-half of the borough area are the dwellings and places of business of the built up section. Beyond this territory are a few scattered dwellings and farmsteads. Three of the principal industries are located in the centre of the town and the Paper Mill is located near the northern borough line on Freeman's Creek.

Freeman's Creek has its source in Keating Township about 7 miles north of the borough and follows a southerly course, passing through the central part of the town to its junction with the Sinnemahoning Creek at Costello, five miles below Austin. The drainage area of Freeman's Creek above the borough comprises about thirteen square miles, containing in the neighborhood of thirty-five dwellings, all located near the stream. The upper half of the area is a farming district. Sinnemahoning Creek is a tributary of the Susquehanna River.

The west branch of Freeman's Creek rises in Keating Township about five miles northwest of the Borough and follows a southeasterly course, entering the town from the west and joins the main stream in the south central part of the borough. This stream drains an area of less than ten square miles of sparsely populated land beyond the town.

The topography of the borough is irregular. East of the main stream the ground surface is precipitous, rising from an elevation of about ten feet above the stream along its bank to about two hundred feet near the eastern borough line. In the fork of the two streams and extending back therefrom for five or six hundred feet the ground surface is quite flat from which it slopes rapidly. To the south of the west branch of the Creek the ground is also flat in the vicinity of the stream and beyond is a precipitous mountain side.

The borough is without a public sewerage system. It has one public sewer and many private sewers in the town. The general method of sewage disposal is into about three hundred dug privy vaults and in many cases into the water course by means of overhanging privies. There are nineteen individual privies overhanging the main branch of Freeman's Creek including three at the works of the Bayless Pulp and Paper Mill. The Goodyear Lumber Company also have two overhanging closets over the stream. Along the west branch of Freeman's Creek are eight closets overhanging the stream.

The borough owns and operates a public water works system. Aside from this there are private water supplies from ten drilled wells and fifteen individual private springs. Springs are numerous in the town, many of which are totally unfit for drinking purposes because of their close proximity to privy vaults.

Public Sewers.

The borough in nineteen hundred and eight built a sewer line to convey domestic sewage from the vicinity of the sources of public water supply. It consists of twelve inch terra cotta pipe extending along Turner Street from Elliott Street a distance of twelve hundred feet, thence along Main Street three hundred feet to

Railroad Street and after passing along Railroad Street for a short distance it extends to Freeman's Creek and discharges about 300 feet south of Main Street. Two lateral lines extend from the main sewers, one on Turner Street and the other 0.6. Manholes are placed at important street corners and at the intersections of along Main Street to beyond Orchard. The minimum grade of the main sewer is the lateral lines. There are about 50 dwellings attached to these sewers.

Private Sewers.

The Department has not made a house to house canvass to ascertain the method of sewage disposal at each individual estates. The following table will give the number of private sewers observed by the Department's representative and as reported by the local authorities:

Location.	Owner.	Diameter of Sewer.	Length of Sewer.	No. of Properties connected.
		Inches.	Feet.	
Rucaber Street,	L. Starkweather,	6 & 4	800	25
Rucaber Street,	L. Starkweather,	4	500	15
Rucaber Street,	Bayless, Gallop, Baldwin and Caskey Co., F. E. Baldwin),	10–4	150	10
Rucaber Street,	Elmer Sick,	4	200	1
Rucaber Street,	L. Musekke,	6–4	150	6
Rucaber Street,	Unknown,	4	100	1
Railroad Street,	Bayless Paper Co.,	6	300	Office
Railroad Street,	Bayless Paper Co.,	18	200	Mfg. Waste
Shea Street,	Unknown,	4	400	
Elliott Street,	Unknown,	4	150	2
Turner Street,	W. H. Colgrove,	6	200	2
Turner Street,	W. Nelson,	4	200	1
Turner Street,	F. E. Baldwin,	4	200	3
Turner Street,	Presbyterian Parsonage,	4	200	1
Railroad Street,	Commercial Hotel,	6	25	1
Main Street,	Goodyear Hotel,	6	100	1
Terrace Street,	N. N. Metcalf and N. Penna. Hospital,	6	300	2
Terrace Street,	Daniel Collins,	4	275	1
School Street,	Public School,	6	300	1
Railroad Street,	Standard Wood Co.,	6	250	1

These sewers all discharge into the west branch of Freeman's Creek or its tributaries.

Location.	Owner.	Diameter of Sewer.	Length of Sewer.	No. of Properties connected.
		Inches.	Feet.	
Main Street,	Unknown,	18 to 12	800	4
Foster Street,	Unknown,	2–4	100	1
Foster Street,	Unknown,	4	100	1
Elliott Street,	C. B. Ballou,	4	100	1

These sewers all discharge into the west branch of Freeman's Creek or its tributaries.

Private Water Works.

There are a number of private water works systems in the borough. One is owned by L. Starkweather. The water is obtained from two springs on the mountain side to the east of the borough above all habitation. The water is piped from the springs through a 2 inch pipe 1,500 feet long to 40 dwellings, the properties of the water works owners. The springs are enclosed in masonry structures, which are kept covered and locked.

The Bayless Pulp and Paper Company obtains water for drinking purposes at the works from two springs and water for industrial and fire purposes from Freeman's Creek. The springs are located on the bank of Freeman's Creek above the works. Masonry structures are built about the springs and they are kept covered and locked. From the spring enclosures water is piped through 1½ inch wrought iron pipes to the works. Across Freeman's Creek near the northern borough line is constructed a re-inforced concrete dam 600 feet long by about 48 feet high with storage approximately 350,000,000 gallons of water. From within the dam an 18 inch pipe extends to the paper mill. Lateral six inch distributing pipes extend from the 18 inch gravity supply pipe throughout the works and afford fire protection. A connection was made between this system and the borough distributing system during 1908 without the State sanction and can be used at any time in the town.

The Standard Wood Company obtains its water supply for drinking purposes from a drilled well 5 inches in diameter by 125 feet deep, cased to rock. The casing extends above the ground surface and is capped. Water is pumped from the well to the works and five houses owned by the company, which are located on Foster Street. The well is located within 100 feet of the west branch of Freeman's Creek. Water for fire purposes at the works is obtained from the creek and is not mixed with the domestic supply.

Public Water Works.

The borough of Austin formerly received its water supply from the Lumber City and Potter County Water Companies. The supply was obtained from a surface stream and springs. During fires water was also taken from a mill pond on the west branch of Freeman's Creek within the borough, through pipes connected with the pumping stations of the industrial plants and forced into the system of pipes laid in some of the streets of the borough. These pipes were owned by the municipality. The supply of water furnished by the water company was so unsatisfactory that their charters were annulled by the Supreme Court and the borough proceeded to build its own water works. The following are the records of the decisions rendered by the Courts:

IN THE SUPREME COURT OF PENNSYLVANIA.

COMMONWEALTH OF PENNSYLVANIA
ex relatione Attorney General,
v.
POTTER COUNTY WATER COMPANY,
Appellant

No. 139 January Term 1904
Appeal from judgment of Court of Common Pleas of Potter County.

Filed June 22, 1905.

POTTER, J.

On September 16, 1901, the Attorney General, on behalf of the Commonwealth, filed in the Court of Common Pleas of Potter County a suggestion for a writ of quo warranto wherein it was set forth that the defendant company was incorporated under the title of the Potter County Water Company, on the third day of December, 1897; that the purpose of the corporation as disclosed by the articles of incorporation is the "supplying water to the public in the borough of Austin, Potter County, Pennsylvania, and to such persons, partnerships and associations residing therein and adjacent thereto as may desire the same." and that the defendant company proceeded to lay pipes in the borough of Austin, and to procure and store water in furtherance of its corporate purpose. It is then averred that since the date of its incorporation, the defendant company "has failed, neglected and refused to perform and carry out the purposes of its incorporation" in that it does not supply the whole borough of Austin, or even that part of it where it has laid its pipes, "with a sufficient supply of water for drinking and domestic purposes," or "for the extinguishment of fires," and in that "the said defendant company has and maintains within the limits of said borough a steam pump connected with a floating dam or mill pond, and in times of low water and when fires occur in said borough, it is so arranged that water is pumped from the mill pond or floating dam into the main service lines of the company, thus polluting and rendering unfit for use the water so furnished to the citizens of the borough. That the said mill dam is so located that it receives the sewage from a large portion of the borough and that the water is impure, unwholesome, poisonous and not fit to use." The suggestion is then made that the court award a writ of quo warranto commanding the defendant company to show cause why it should not be ousted and its character declared null and void. The defendant company in its original answer denied specifically the material allegations of the suggestion of the Attorney General, and averred that "it has erected and maintained, and does now maintain, adequate reservoirs for the storing of water, and has laid and maintained private mains, pipe lines and connections to and into the borough of Austin, and it has been since its incorporation and the construction of its works, engaged in supplying a sufficient quantity of pure water to the public of said borough for all purposes within the terms of its charter." Subsequently in an amendment to the answer, the defendant company averred "that the connection between the steam pump and said mill pond is only maintained for the technical reason that in the grant of the franchise by the borough of Austin to John P. McIntyre, under which grant the Potter County Water Company entered said borough it is enacted and provided 'Section 5. The said John P. McIntyre, his associates, successors and assigns, shall not disconnect the pump which was purchased by said private parties and the tank of the Standard Wood Company, attached to said iron line, but said pump and tank shall be kept ready for use in case of necessity."

A formal replication was filed to the answer, and the case regularly proceeded to trial before a jury. At the trial, a motion was made on behalf of the defendant company, to quash the writ, for the reason that the court was without jurisdiction to try, in this form of action, the issued framed by the pleadings, it being contended that the Act of April 29, 1874, P. L. 73, provides a remedy and repeals by implication so much of the Act of June 14, 1836, as relates to water and gas companies. The court below overruled the motion to quash, and after a trial upon the merits, the jury returned a verdict in favor of the Commonwealth. In accordance with this verdict, the judgment of ouster was entered on the 22nd day of April, 1903 against the defendant corporation, and a perpetual injunction was issued "restraining said defendant, its officers, agents and servants from exercising any of the rights, liberties or franchises conferred by Act of Assembly or the character above named."

The assignments of error question the jurisdiction of the court, and complain of the exclusion of certain evidence, and also question the sufficiency of the evidence to support a judgment of ouster.

We have no doubt whatever as to the jurisdiction of the court to grant relief in the form. The second section of the Act of June 14, 1836, P. L. 621 authorizes the courts of Common Pleas to issue writs of quo warranto, inter alia, "in case any corporation as aforesaid shall forfeit by misuser or non user, its corporate rights, privileges or franchises."

It is contended on behalf of the defendant Company that it was incorporated under the Act of April 29, 1874, and that the third clause of section 34 of that Act provides a method of relief to any citizen who may make complaint of the impurity of the water furnished, and that, subsequently, this remedy excludes that by quo warranto proceedings under the Act of 1836. It is true that any private citizen may, under the Act of 1874, file a bill in the court of common pleas of the proper county, and that the court, after hearing, is empowered to make such order as may seem just and equitable, and may compel the corporation to correct the evil complained of. But this remedy is given to the private citizen for the purpose of redressing a wrong done to him as an individual user of water. The remedy by quo warranto, on the other hand, is instituted by suggestion of the Attorney General for the correction of a wrong committed against the general public by the corporation, in violation or abuse of its charter rights. In the absence of any express words of exclusion in the Act of 1874, we see no reason for holding that it takes away from the Commonwealth by implication the remedy for the correction of a public injury. We have no doubt as to the sufficiency of the evidence in this case to support the judgment ouster. It appears that, prior to the incorporation of the defendant company the borough of Austin was supplied with water for domestic use from springs by individuals and a corporation called the Lumber City Water Company. For the purpose of affording protection against fire, certain individuals constucted, and then transferred to the borough, a line of wrought iron pipe, which was connected with a mill pond in the lower part of the borough into which the sewage of the town was discharged. The defendant company secured the control of the Lumber City Water Company, and also of the iron line, from the borough, obligating itself in return therefor to furnish to the borough, water for fire purposes for a specified number of hydrants. In time of drought and in cases of fire, the defendant company pumped the water from the pond through the iron pipe into its main water pipes. The evidence on the part of the Commonwealth was clear that from the year 1897 to and including 1902, the water furnished by the defendant company for domestic consumption to the public, was at frequent times injurious and unwholesome, and that it was of an oily consistency, reddish in color, disagreeable in odor, and was contaminated with sewage and contained the germs of disease; and was consequently unfit for drinking or cooking, or even for the purpose of washing. There was, of course, evidence on the part of the defendant company tending to show the wholesome and pure character of the water which is furnished. But the credibility of the witnesses and the weight to be given to the testimony in this respect, was for the jury, and they, by their verdict, have sustained the claims of the Commonwealth.

The appellant, also complains of the exclusions as evidence, by the court below, of certain portions of the ordinance of the borough, which provided that the connection with the iron line and the pond should be maintained. It was argued that by reason of the contract contained in the ordinances, the water company was forbidden to disconnect the pumps attached to the iron line, and that it was not therefore responsible for the bad character of water which comes from the pond. But this was only to provide against contingencies, and it is apparent that, even if it was necessary to use water from the pond at certain times, as in case of fire, yet reason and common sense would require after such use, a thorough flushing out of the pipes, in order to prevent pollution of the water supplied for domestic purposes. Nothing within the limits of reason could justify a failure upon the part of the water company to furnish to the public water which was at least reasonably pure and comparatively wholesome.

In affirming the second point for charge presented on behalf of the defendant company, the court below instructed the jury that it was not sufficient to show a single failure to furnish a sufficient supply of wholesome water, not even to prove several isolated acts of negligence, but that a continued and persistent neglect of duty must be shown, or the verdict must be for the defendant. The court also repeatedly said to the jury, in the course of the charge, that before the charter could be revoked, they must find a substantial violation of the duty owed by the corporation, and that occasional violation or instances of neglect would not be sufficient. Over and over again the test was impressed upon the jury in such language as this: "It would not be an occasional violation, an occasional neglect of their duty which would authorize the revocation of their charter." "The failure of this defendant company to perform its corporate duties, to perform the duties imposed upon it by the law and its charter, must not be an occasional failure, but there must be a substantial failure, and there must be such failures as are continuous and persisted in." And again, if "the water was not polluted—or that it was only upon isolated occasions that it was turned on, happening once or twice, or a few times, then for that you would not be justified in finding a wilfull, negligent and substantial violation of the charter duties of this corporation." And lastly, he said to the jury: "If you find the failure to comply with their corporate duties has not been substantial, wilful and negligent failure; that the failure to supply water as to quantity or quality was only occasional and did not cover a long period of time, and was not continued, it would be equally your duty to find a verdict in favor of the defendant company." Yet, after this fair and careful charge, the jury sustained the contention of the Commonwealth.

We see nothing in the manner in which the case was submitted to the jury of which the defendant company has any just reason to complain. The assignments of error are overruled and the judgment is affirmed.

Under a decision of the Supreme Court the Lumber City Water Company, the principal officials and managers of which are the same as were in charge of and operating the Potter County Water Company, at the time of the judgment and ouster and the issuing of the injunction against the Potter County Water Company, operating the water works plant in Austin claiming the right to operate same under and by virtue of its charter and corporation, the sale of which had previously been made to the said Potter County Water Company. Proceedings follow and the findings of the Supreme Court are as follows:—

IN THE SUPREME COURT OF PENNSYLVANIA, EASTERN DISTRICT.

Commonwealth of Pennsylvania ex relatione the Attorney General v. The Lumber City Water Company.	No. 163 January Term, 1908. Appeal from C. P. Potter.

Filed June 22, 1909.

PER CURIAM

On or about June 9, 1889, the Lumber City Water Company executed and sometime thereafter delivered to the Potter County Water Company, a similar corporation, a deed for all of its franchises and property, real, personal and mixed. That the sale was made to the Potter County Water Company is admitted in the answer, and there is nothing to show that it was not in all respects valid or that any statutory requirment had not been complied with. The following findings of fact are not assigned as error: "On or about the ninth day of June, 1898, the defendant company executed, and sometime thereafter, but before the commencement of this action, delivered to the Potter County Water Company, a like corporation, incorporated for the same purpose, a deed conveying to the said Potter County Water Company its successors and assigns, all of its (the said defendant company's) water works, pipes, mains, hydrants and all franchises, contracts, bills, claims and all property, real, personal and mixed. Immediately upon the execution of the said deed, the defendant company relinquished possession of and abandoned all its water lines, reservoirs and franchises, and ceased to operate any water lines and ceased and discontinued the furnishing of water. The Potter County Water Company took immediate possession of and operated the water system of the defendant company (claiming to own the same by virtue of said deed) and continued to hold the same and to have and enjoy all the property, rights, franchises and privileges of the defendant company, and all its property, real, personal and mixed, until the judgment of ouster was entered against it by the Court of Common Pleas of Potter County and an injunction was issued against it by the said court."

By the sale everything that belonged to the Lumber City Water Company became vested in the Potter County Water Company: Hey v. Springfield Water Co., 207 Pa. 38; but the Act of April 17, 1876, P. L. 30, sec. 5, which authorized the sale, provides that when it was made the selling corporation ceased to exist. The words of the act are, that after such a sale the corporation making it "shall cease to exist." There is no room for doubt as to the effect of the sale in this case, for it is plainly stated in the act. After the Lumber City Water Company made the sale it ceased to exist, and it is hypercriticism on the part of those having charge of the corpse of the company to say that its existence is now admitted by the Commonwealth in this proceeding to have a judicial declaration, that, by the words of the statute, it dies when it sold all that it possessed. The judgment is affirmed on the legal conclusions of the learned referee.

On June 27th, 1906, the Commissioner of Health issued a permit to the borough of Austin to construct a municipal water works system and approved certain sources of water supply under the following conditions and stipulations:

"FIRST: That the only source of water that shall be introduced into the new water pipe system and used for drinking purposes shall be that derived from the "Austin" springs and the "Vannetta" springs.

"SECOND: That the borough shall caused to be removed all privies, cesspools, hen yards, and every menace in the vicinity of the "Austin" springs, and to this end shall provide a sewer for the removal of sewage, wash water and slops from the buildings in the vicinity of said springs, and as a substitute for the present methods of disposal of household wastes which are to be done away with, the borough shall provide water closets and modern plumbing facilities and connect the same with said sewer, which shall empty into Freeman's Run. Said facilities shall be afforded to every dwelling in the vicinity of said "Austin" springs.

"THIRD: Every one of the said "Austin" springs shall be walled up in masonry tight construction, carried up to a height of at least four feet from the ground; and each well shall be piped by water tight conduit to a common collecting reservoir in the vicinity, which reservoir shall be made water tight and be covered over. The ground around each well shall be filled in and about all of the wells shall be filled in to a depth of at least three feet and be enclosed by a tight board fence. This enclosure shall be in the vicinity of a quarter of an acre in extent, wherein the springs near the collecting reservoir are located. A much smaller enclosure shall be made about the spring north of the existing road.

"FOURTH: The borough shall acquire at least one-half an acre of ground about the "Vannetta" springs and provide a secure enclosure for the springs and the collecting well there. The surface water in the road in the vicinity shall never be permitted to drain towards said springs.

"FIFTH: The borough shall maintain and keep in repair its existing fire service mains but these shall be absolutely independent of the proposed new water pipes, and the water in the fire mains shall never be used for drinking purposes.

"SIXTH: The borough shall prepare plans of the springs and lands about them, the houses, buildings, sewers, masonry structures, pipes, valves, etc., and file said plans with the State Commissioner of Health. Also, plans of the pumping station, main collecting reservoir, street mains and storage reservoirs, and plans of the fire mains and their connections with the pumps shall be prepared of the works as they are completed, and said plans shall be filed with the Commissioner of Health.

"SEVENTH: If at any time the Commissioner of Health determines that the water so supplied to the borough has become unsuitable for the purpose for which it is used, then said supply shall be discontinued or such remedial measures adopted as the Commissioner of Health may suggest.

"EIGHTH: Adequate facilities for draining the water pipe system at the low points in the street mains shall be provided.

"NINTH: Weekly reports on blanks to be suggested by the Commissioner of Health shall be kept and submitted to the Commissioner of Health relative to the operation of the system."

The eighth condition has been complied with. The first condition has not been complied with and the borough has already obtained water from another spring, 4 drilled wells, drilled in 1908, and also from two private drilled wells in addition to using Freeman's Creek water.

The 2nd condition has been fulfilled in part, a public sewer has been built along Elliott and Turner Streets and most of the houses in close proximity to the spring have been provided with modern plumbing facilities and been connected to this sewer line, which has an outlet to Freeman's Creek near Main

Street. A plan of this sewer accompanied by an application for approval of the same was received by this Department under date of July 22nd, 1907. There still exist a few privy vaults above the springs on the following properties: Frederick Spearing, Mrs. Myra White, both on Turner Street, and E. E. Carson on Elliott Street, all within a few hundred feet distance. In addition to these there is a private sewer discharging into the overflow from the Ballou Spring from the property of C. F. Ballou. The stream flowing from the Ballou spring passes within a few feet of the springs and wells supplying the borough with water.

The 3rd condition has been fulfilled with the exception of enclosing the springs with tight board fences. A wire fence has been substituted.

As regards the 4th condition, the borough has not as yet acquired the right to use the Vannetta springs.

The 5th condition has not been fulfilled, instead of maintaining the old fire mains as required, the borough authorities chose to abandon the old mains and to connect the new system to the fire system of the Bayless Pulp and Paper Company. This was done without State sanction.

The 6th condition has been fulfilled in part only. There remain to be submitted plans of the main collecting reservoir and of the fire mains and their connections with the pumps.

The existing system comprises 6 springs and 3 wells grouped together and located west of Turner Street and south of Elliott Street within the borough, a collecting basin at the springs, a gravity discharge to the collecting basin at the pump station, a pumping station, a distributing system and an equalizing basin on the hill in the borough. Also a connection to the Freeman's Creek supply hereinbefore described in connection with the private system of the Bayless Pulp and Paper Company works. There is also a connection to the private well of Warner and also the well supply of the Standard Wood Company.

To the north and east of the 6 springs and 3 wells and at a distance not greater than 150 feet are several dwellings. On the west the ground slopes rapidly from the springs and is uninhabited. The 6 springs in this vicinity are all enclosed in concrete masonry structures, provided with movable wooden covers. From 5 springs water is piped to a large spring enclosure, from which it passes through a 6 inch terra cotta pipe 1,200 feet long leading to a collecting well at the pumping station. A small spring run, the source of which is the Ballou spring which receives sewage from a private sewer owned by C. F. Ballou, passes within a few feet of 3 of the springs, to its junction with the west branch of Freeman's Creek. The terra cotta gravity pipe to the collecting well and pump station is laid for considerable distance under the bed of the stream at an approximate depth of 2 feet.

The 3 drilled wells are all 5 inches in diameter and have a depth of 100, 125 and 300 feet respectively. Each well is cased to rock. The casings extend above the ground surface, and are capped. The discharge from the wells is piped into the main spring enclosures. The fourth well is located at the pumping station and is 5 inches in diameter by 125 feet deep cased to rock. A 2 inch pipe extends from the well to the collecting basin. The well casing is cut off 2 feet below the ground surface and is provided with a wooden plug. The 7th or Dirches Spring is located at Goodyear Avenue and Main Street just outside of the pumping station. It is enclosed in a masonry structure 4 feet by 4 feet in plan by 6 feet deep with a movable wooden cover and water is piped directly from the spring into the collecting well.

One of the private wells, termed the Warner well, is located on the Warner property about midway between the springs and pumping station. It is 5 inches in diameter and 160 feet deep, cased to rock. A privy vault on the Warner property and one at the Swedish Church are within 50 feet of the well. The well water is piped to the gravity supply pipe extending from the springs. The other private well is that of the Standard Wood Co. previously described under "Private Water Works System."

The collecting well at the pumping station is of concrete construction thirty feet long with an average width of twelve feet and a depth of nine feet having a capacity of 24,000 gallons. Surface water may not enter the well and it is provided with a wooden cover which is kept locked.

The pumping station is of brick construction and in it are two Dean triplex plunger pumps operated by two Struthers Wells 20 H. P. gas engines equipped with emergency gasoline engines. The pumps have a combined rated capacity of 634,480 gallons daily. From the collecting well water is pumped through a 6 inch suction pipe and discharged into an 8 inch distributing main extending along Main Street and terminating in a storage and distributing reservoir located on the hillside, at an elevation of about 200 feet above the business section of the town. The distributing pipes are 6 inches in diameter extending through the borough streets and a six inch pipe about one mile long extends northward along Rucaber Street to the fire system of the Bayless Pulp and Paper Company. The borough piping system is provided with fire hydrants which are well distributed. Fire hydrants are also provided on dead ends to facilitate draining: The pipe extends from the well of the Standard Wood Company and connects with the borough piping system on Foster Street. There are no connections, so it is reported, made between the borough pipes and the fire system of this or the remaining industrial plants.

The storage and distributing reservoir is of concrete construction 50 feet in diameter and about 18 feet deep. At the overflow it has a depth of 16 feet and a storage capacity of 235,620 gallons. Surface water may not enter the basin and it is roofed over with a wooden structure. A common inlet and outlet pipe enters the basin at the bottom. There is no blow off provided in the basin for cleaning.

There are 400 domestic connections to the piping system. The maximum consumption is about 185,000 gallons daily. The minimum flow of all of the sources of supply is estimated to be in the neighborhood of 200,000 gallons daily.

The supply from the paper mill piping system was used for fire purposes on October 12th and November 3rd, of this year, on the first occasion for 4 minutes and on the second for 1½ hours. Borough pipes were not drained for a number of weeks afterward and the water consumers were not immediately notified to boil the water.

Applications.

The borough, in its application of July 22nd, 1907, for approval of sewer extensions made in compliance with the terms of a permit issued by the Commissioner of Health relative to the public water-works represent the following:

"That the State Board of Health has conditioned its permission to the said Borough to construct a municipal water system upon the proper sewering of the district near the junction of Turner Street and Elliott Street. That instead of running a sewer along Elliott Street and discharging into Freeman Run, opposite said street, the sanitary conditions of the borough would be much improved by running the sewer as proposed in plan. That some twenty privies would be done away with and the sewage emptied below the main residence part of the town."

In the application of October 26th, 1907, the following was represented in connection with additional sources of water supply:

"Dr Samuel G. Dixon,
"Commissioner of Health,
"Harrisburg, Penna.

"Dear Sir:—

"At the request of our borough council we ask permission to add to source of supply of the municipal water plant of this borough, a spring known as the Dirches Spring, located along the southern side of Main Street, near Goodyear Avenue, as shown on a map of the borough, accompanying this application. And also permission to add to the present source of supply drilled wells as it may be necessary from time to time, we to furnish detailed plans of the location, construction, etc., of the drilled wells for your approval, prior to their being connected with the municipal water plant.

"The application for these additional sources of supply is made for the reason, that the present source of supply will not be sufficient to supply all of the inhabitants of the borough, and we wish to extend our water lines as rapidly as the finances of the borough will admit, to supply the demands of all the inhabitants of the borough."

"Very resp'y Yours,
"H. D. CASKEY, Boro, Secy."

The borough authorities did not wait for action on this application nor did they comply with all of the conditions of the prior water decree as hereinbefore stated, nor did they request permission to use the private sources of supply, but proceeded independently to make such changes and alterations to their system and to secure such source of supply as they deemed expedient without notifying the Department of these acts.

Typhoid Fever Epidemic.

On January 4th two officers of the Engineering Division of the Department, Engineer William H. Ennis and Inspector Ira F. Zeigler, were sent to Austin to conduct a thorough investigation.

The facts relative to the typhoid fever cases occurring up to and including December 31st, 1910, are given in the following table:

Date of Onset.	Name of Patient.	Address.	Age.	Occupation.	No. in Family.	Water Supply.		Sewage Disposal.		Sewer.	Milk.
						Springs and Wells.	Public.	Privy.	Cesspool.		
Oct. 15	Hilda Mandburg, ...	Elliott St., ..	14	Student, ...	7	Hayes and Ballou, ...	Public	Privy	....	....	Own—first case.
Nov. 1	Christy Maylan, ...	Costello Ave.,	32	Housewife, ...	4		Public	Privy	....	....	Condensed.
Nov. 1	Geo. Mohan, ...	Shea St., ...	35	Bookkeeper, .	10	Hayes, ...	Public		....	Sewer	Schaeffer.
Nov. 8	Geo. Horton, ...	Elliott St., ..	45	Merchant, ...	4	Hayes, ...	Public	Ov'g Privy	....	....	Ballou and Hofftaler.
Nov. 10	Anna Anderson, ...	Shea St., ...	20	Housekeeper,	4	Hayes, ...	Public		Cesspool	....	Own.
Nov. 11	Mrs. Archie Campbell,	Turner St., ..	22	Housewife, ...	4		Public		....	Sewer	Geo. Shaeffer.
Nov. 15	Harry Andrews, ...	Railroad St., .	3	At home, ...	8	Hayes, ...	Public	Privy	....	....	Mandburg.
Nov. 15	John Anderson, ...	Railroad St., .	9	Student, ...	8	Hayes, ...	Public	Privy	....	....	Mandburg.
Nov. 15	Ella Anderson, ...	Railroad St., .	7	Student.	8	Hayes, ...	Public	Privy	....	....	Mandburg.
Nov. 15	Max Lehman, ...	Shea St., ...	9	Student, ...	6	Hayes, ...	Public		....	Sewer	Ballou.
Nov. 15	Mattie Edwards, ...	Costello Ave.,	30	Cook, ...	3		Public		....	Sewer	Gilroy.
Nov. 16	Guston Anderson, ...	School St., ...	31	Foreman, ...	13	Lbr. City W. Co. Spr.	Public		Cesspool	....	Own.
Nov. 20	Carl Anderson, ...	Railroad St., .	5	At home, ...	8	Hayes, ...	Public	Privy	....	....	Mandburg.
Nov. 20	James Goodspeed, ...	Railroad St., .	19	Laborer, ...	2	Spring, ...	Public	Privy	....	....	Deckers.
Nov. 21	Alfred Anderson, ...	Railroad St., .	10	Student, ...	8	Hayes, ...	Public	Privy	....	....	Mandburg.
Nov. 24	Bertha Mandburg, ...	Elliott St., ..	7	Student, ...	7	Hayes and Ballou, ...	Public	Privy	....	....	Own.
Nov. 24	Mrs. Geo. Seyler, ...	Railroad St., .	28	Housewife, ...	4	Drilled well, ...	Public	Privy	....	....	Condensed.
Nov. 24	Clifford Hamlin, ...	Rueaber St., .	35	Foreman, ...	4	Bayless spring, ...	Public		....	Sewer	Own.
Nov. 25	Wm. Williams, ...	Elliott St., ..	32	Laborer, ...	4	Hayes, ...	Public		....	Sewer	Ballou.
Nov. 25	Coila Parks, ...	Grace St., ...	7	Student, ...	11	Starkweather spring, ..	Public		....	Sewer	Buber and Baker.
Nov. 25	Ed. Murphy, ...	Rueaber St., .	19	Laborer, ...	4	Bayless Springs, ...	Public		....	Sewer	Condensed.
Nov. 26	Maud Wolfinger, ...	Scoval St., ...	20	Cutter, ...	5	Bayless Springs, ...	Public	Privy	....	....	Gilroy.
Nov. 28	Andrews Mohan, ...	Shea St., ...	7	Student, ...	10	Hayes, ...	Public		....	Sewer	Sheaffer.
Dec. 1	Arthur Swarz, ...	School St., ...	8	Student, ...	5	Cold Spring, ...	Public	Privy	....	....	Gilroy.
Dec. 1	Iva Lynch, ...	Turner St., ..	32	Housewife, ...	2	Drilled well, ...	Public		....	Sewer	Sheaffer.
Dec. 1	Chas. Clymer, ...	Thorne St., ..	16	Student, ...	7			Privy	....	....	Sheaffer.
Dec. 1	Leonard Masket, ...	Thorne St., ..	14	Student, ...	7	Lbr. City W. Co. Spr.	Public		....	Sewer	Condensed.
Dec. 2	Lawrence Buber, ...	Scoval St., ...	9	Student, ...	9	Carters Spring, ...	Public	Privy	....	....	Own.
Dec. 4	Gothfred Sumguest, ..	Scoval St., ...	28	Foreman, ...	13	Lbr. City W. Co. Spr.	Public		Cesspool	....	Own.
Dec. 4	Frank Mack, ...	Cannot speak English and has no family connection in town.									
Dec. 8	Pearl Tate, ...	Summit St., ..	10	Student, ...	7		Public		....	Sewer	Austin.
Dec. 9	Frank Rhoades, ...	Rueaber St., .	45	Merchant, ...	4	Hayes, ...	Public	Privy	....	....	Jacob Siek.
Dec. 12	Tony Costa, ...	Benson St., ..	19	Laborer, ...	6	Bayless Springs, ...	Public	Privy	....	....	Condensed.
Dec. 12	Clifford Swansen, ...	Costello Ave.,	13	Student, ...	8		Public	Privy	....	....	Poestl.
Dec. 15	Wm. Bachman, ...	Thorne St., ..	11	Student, ...	8		Public		....	Sewer	Own.
Dec. 22	Elsie Swanson, ...	Scoval St., ...	13	Student, ...	4		Public	Privy	....	....	Gilroy.
Dec. 25	Daniel Arehort, ...	Foster St., ...	18	Woodcutter, ..	9	Standard W. Co. Well.	Public	Privy	....	....	Own.
Dec. 31	Wm. Swaine, ...	Austin St., ..	35	Conductor, ...	2		Public		....	Sewer	J. Young.

The local health authorities report that prior to the outbreak of November, typhoid fever was of rare occurrence. During the Fall of 1900 there was an epidemic of about 200 cases generally attributed to the pumping of the polluted waters of Freeman's Creek into the distributing pipes of the water company. The State records do not show any cases of the disease occurring between the years 1907 and 1910. Between October 15th and December 31st inclusive, of 1910 there was 38 cases of typhoid fever and one death.

The first patient was taken ill on October 13th, two days after Freeman's Creek supply was turned into the water works system. On November 24th the patient's sister was stricken with typhoid. This patient was nursed by her mother, who kept two cows on the premises and milked them. Among the customers who used this Mandberg milk there were five victims of typhoid, all in the Anderson family: John on November 15th, Ellen on November 15th, Guston on November 16th, Carl on November 20th and Alfred on November 21st. The Andersons attended school and drank out of a common drinking cup. They used city water and also water from the Ballou Spring, which was polluted with sewage from the Ballou residence, and also water from Hayes Spring within 25 feet of which was an overhanging privy. The Department's officers put warning signs at both of these springs and ordered the discontinuance of the use of their waters. An order was issued to the local Board of Health prohibiting the use or sale of any milk from any premises whereon there was typhoid fever.

At the Hayes dwelling an occupant had been ill for several weeks. It is believed this was a case of typhoid fever, although the physician did not report the case as such, not being sure of his diagnosis. The Department could not ascertain that typhoid fever had occurred at the Ballou household within a year.

The second case of fever occurred on November 1st, 18 days after the first case and 21 days after the Freeman's Creek raw water was turned into the public system for the first time. Public water only was used by the patient. Condensed milk was used. The third case occurred on the same day as the second case and 7 days lapsed before the fourth case, which was 5 days after Freeman's Creek water was turned into the system for the second time. Both the third, fourth and fifth cases used the Hayes spring water as well as the public supply. In fact, all of the 38 cases obtained public water at times.

The investigation by the Department brought out certain prominent facts, namely: first, all the cases, with one doubtful exception. used the public water supply; second, nearly 37 per cent. of the cases were in the vicinity of the Hayes and Ballou springs and used water from these sources; third, nearly 40 per cent. of the cases were school children attending the same school; fourth, nearly 50 per cent. of the cases occurred between five days and three weeks after the introduction of the raw Freeman's Creek water into the public system for the second time.

It will never be known what originated the outbreak. The public supply may have been one medium of the transmission of the infection. The Department has not made a sanitary inspection of the watershed of Freeman's Creek because it did not know that it was being used as a source of public water supply. The great number of cases occurring after the second introduction of the creek water into the public system may have been a coincidence only. So far as could be ascertained, there was no typhoid fever on the watershed of Freeman's Creek during or prior to the typhoid outbreak in November. The only case that could be found was that which occurred on the shed during October of 1909.

Another possible and quite probable source of sewage pollution of the public supply was the Ballou sewer emptying into the run at the Ballou spring. This spring is at the head of Ballou Run and the sewage from the house flows down the whole length of this run by the six springs. The terra cotta pipe leading from the collecting well at the six springs extends down this run and at several places fell below and had a depth of about 2 feet from the bed of the run. On or about November 1st the borough begun to lay a new terra cotta pipe owing to the faulty condition of the old pipe. The line leaked and sewage from the Ballou household undoubtedly did pass through the defective joints into the pipe line leading to the pumping station. The work of laying the new pipe in the bed of the channel was completed about December 1st. To say the least, strict precautions would have been necessary to have kept the Ballou Run water and sewage from the public system.

The several samples of water collected by the Department at different points in the public system during January, 1911, did not show the presence of any sewage pollution in the water, but this is not to be taken as evidence of the purity of the supply prior to January.

Before the Department's officials arrived in the town the Board of Health had drained the water-works system and flushed out the reservoir mains.

The milk supply was furnished to about 123 families by 15 principal dealers. In addition there were about 60 properties on which cows were kept and the milk was used by one or more families. At three properties whereon typhoid fever existed and where milk was produced, namely at the Mandberg, Buber and Bachman properties, the milk was sold to others besides members of the household. No cases of typhoid fever occurred among the customers of Bachman, but one among the customers of Buber and 5 already mentioned among the customers of Mandberg.

The borough's ice supply is obtained from Freeman's Creek on the pond above the dam.

All of the circumstances relative to water works systems were in mind and formed the basis for the following discussion and decree issued by the Commissioner of Health to the Borough on May 10th, 1911.

Discussion.

The assessed valuation of Austin borough is reported to be four hundred and twenty thousand dollars, and the bonded indebtedness twenty-three thousand dollars. If these figures be correct, the municipal borrowing capacity at the present time is in the neighborhood of six thousand four hundred dollars only.

Undoubtedly the municipality needs for fire purposes the connection to Freeman's Creek, but this source is a dangerous one and the borough erred in obtaining it without notifying the Department and receiving its sanction. A sanitary survey of the watershed will be instituted at once and all sources of stream pollution will be removed as a safeguard to public health. The borough should maintain a monthly patrol of the watershed as a further protection and in this work the Department will be very glad and willing to lend its assistance.

As the present supply is not an entirely safe one since water taken from the ground in the vicinity of habitation is more or less open to suspicion, more especially where the disposal of sewage is into earth vaults, the public should boil the water used for domestic purposes as an absolute safeguard. If the borough would acquire the Vannetta Springs and protect them as stipulated in a former decree, it would be better off, but even with this additional supply some further borough to acquire the use of the old mains of the water company and to connect these with the fire service water from Freeman's Creek. In this way there would be an absolute separation of the creek water for fire purposes from the spring supply for domestic purposes.

The existing tile pipe along the bed of Ballou Run is a menace to public health. It should be taken up and re-laid with a cast iron pipe having lead joints. The Ballou sewer should be discontinued and proper facilities should be provided at all of the dwellings along Ballou Run to prevent any sewage contamination of the waters. It is quite possible that waters from the run feed the six springs used by the borough and a reasonable protection would be to keep surface wash from yards and streets from entering the run above the springs.

More attention should be bestowed by the local authorities on the disposal of sewage at the houses in the vicinity of springs. All contamination of the borough supply should be obviated.

The one well should also be protected in a similar way and the casing of the pipe at the pumping station should be carried up above the ground surface and be capped.

The Borough authorities should also do away with all privies overhanging any natural watercourse and in general the method of disposal of household wastes throughout the town should be improved and made sanitary.

Conclusions and Decree of the Commissioner of Health.

In view of the foregoing circumstances I have determined that the existing water works and sources of supply are prejudicial to the public health, and will be until the suggestions hereinbefore made be carried out by the local authorities, and I do hereby and herein so decree and order:

FIRST: That the borough forthwith file in the office of the State Department of Health complete plans of its entire water works system, including pipes and stations, reservoirs and basins with all connections.

SECOND: That the suggestions hereinbefore given shall be carried out by the local authorities and that a report of the things done in detail be filed in the office of the Commissioner of Health.

THIRD: That all spring enclosures shall be kept securely locked.

FOURTH: That daily reports of the operation of the pumping station and water works system be kept on blank forms satisfactory to the Commissioner of Health, and that copies thereof be filed monthly in the office of the Department.

FIFTH: That the borough shall make a monthly inspection of all occupied estates on Freeman's Creek above the dam and report to the Commissioner of Health the existence of any stream pollution or menace to the purity of the waters of Freeman's Creek.

SIXTH: That the local Board of Health make an examination of all individual springs and wells in the borough and condemn and put out of use all such as are found to be polluted or suspicious. That all overhanging privies along the banks of the streams in the borough or anywhere in the town shall be done away with, and that finally the local board of health notify the public to boil all water for domestic purposes.

The dairies in the borough should be frequently inspected by the local board of health and customary precautions taken by health authorities should be enforced in Austin to protect the purity of these milk supplies.

SAMUEL G. DIXON,
Commissioner of Health.

Harrisburg, Pa., May 10th, 1911.

22. TYPHOID FEVER AT BETHLEHEM.

The last part of the year 1911 the Borough of Bethlehem, Northampton County, Pennsylvania, determined to obtain a new source of supply from the drilled wells known as Illick Mills Wells. The existing spring supply to the borough was contaminated. Their use during the early autumn had resulted in an extensive typhoid fever epidemic and a larger epidemic of dysentery. Dr. Hunt made a thorough study of the diseases. Assistant Engineer Irwin, with several inspectors of the Engineering Division conducted the operations relative to disinfecting the water supply, canvassing the onsets of typhoid and supervising all sanitary work. The following is a report of the operations of the Engineering Division and relevant matters:

Prior Decrees of the Commissioner of Health.

It appears that on May 27th, 1907, a decree was issued to the Board of Water Commissioners of the borough of Bethlehem by the Commissioner of Health, in which decree, after reviewing the circumstances, the Commissioner continued, "I have determined that the present source of supply of water to the public in Bethlehem is prejudicial to public health, and, therefore, apprise the Board of Water Commissioners of the danger to the public accompanying the use of the existing source of supply and hereby advise and request the Water Commissioners to prepare and submit to the State Department of Health for consideration, a plan or plans for the supplying of pure water to the public."

The 1907 decree describes the water works system. Briefly the daily consumption of about 1,200,000 gallons is delivered to the standpipe by an old Dean pump and an old Worthington pump. Both are much worn and liable to break down at any time. The standpipes, one 24 feet in diameter by 40 feet high, and the other 50 feet in diameter by 50 feet high are located on the highest point in the town. The pressure when the tanks are full ranges from 80 pounds in the lower to 20 pounds in the high districts where the pressure for fire service and for domestic service is unsatisfactory.

The spring from which the supply is taken is located at the foot of the bluff on which the town is built in the immediate vicinity of streets, hotels, business blocks and dwellings. The spring is a flowing one, is walled up and housed over. The supply is nearly exhausted daily. There is an emergency intake to the creek but the pipe is filled up with gravel.

The limestone deposit from which the spring issues is said to have its strike north and south and pitch in such a way as to permit house drainage from the town west of Monocacy Creek to find its way toward the spring. The Department thought in 1907, and so stated in its report that subterranean connections may be so extensive that an opening up of direct communication between the fissures which conceal the town sewage and those supplying the spring might happen at any time. The well drilled by the town between the spring and the pump house is 300 feet deep but the water, though plentiful, is so inferior in quality that it could not be used for drinking purposes.

Out of 29 samples of water taken of the spring and tested by the Department in the years 1906 and 1907, sewage organisms were present in 12 samples.

West Bethlehem and South Bethlehem are wholly furnished by the Bethlehem City Water Company, the source being filtered river water. In reference to Bethlehem supply, the Commissioner further stated in the 1907 decree as follows:

"Such records as the Department has for ready reference do not show the prevalence of typhoid fever in Bethlehem in excess of that of surrounding municipalities. In the year 1903, the disease was epidemic in all of the Bethlehems. Because an epidemic has not occurred among the users of the spring water is no reason why the Bethlehem spring should be considered a safe source. The risk run by the borough's consumers involves such grave consequences, that there is but one position which the State can assume relative to the supply, namely, that it is dangerous and should be abandoned unless the water be filtered."

In the 1908 permit approving the drilled wells for which a permit is again requested since the plans for introducting water in the town are now different, contains a full description of the Illick Mill property owned by the borough and of the two wells to which reference may be had for particulars. Briefly, this property comprises 20 acres located along the Monocacy Creek a mile or so above the borough. The creek area at this point is 43 square miles under extensive cultivation on which there is a population of 40,000 persons including two boroughs. Bath and Chapman.

In the 1908 permit which was issued under the following conditions it was stated that although the wells are deep and at a considerable distance from thickly built up communities, it is not impossible that the water at times may become polluted by sewage and that therefore, frequent bacteriological tests of the water of the wells should be made. The conditions and stipulations of this permit were:

FIRST: Ample facilities shall be provided by means of blowoffs placed at all low points whereby the rising main, standpipe and supply main may be completely drained.

SECOND: Detailed plans of the layout at the pumping station and of the rising main, standpipe and supply main showing all valves and connections, shall be filed with and approved by the Commissioner of Health before work is commenced on these respective parts of the system and before water is supplied to the public from the new source, a description and, if necessary, plans of the construction of the wells shall be filed with the Commissioner of Health.

THIRD: After the proposed works are completed and the supply of water to the public from the proposed source has been commenced, water shall not be furnished to the public from any other source without a permit from the Commissioner of Health.

FOURTH: It is the purpose of the Department to obtain samples of water for analyses from the various parts of the system from time to time, and the petitioners shall render such assistance in carrying out this idea as may be necessary, and shall make such alterations in the system and source of supply as the Commissioner of Health may suggest or approve or demand in the interests of the public health to the end that the water supplied through the water works of the petitioners shall not be prejudicial to the public health.

FIFTH: Detail records of the operation of the works shall be properly kept on blank forms to be suggested by this Department and copies thereof shall be furnished to the Commissioner of Health.

SIXTH: The permission herein granted is given under the express stipulation that the plans of the present works already called for in the decree of the Commissioner shall be filed with the said Commissioner of Health on or before September first, nineteen hundred and eight.

The Epidemic of 1911.

On June 14th, 1911, the borough secretary notified the Commissioner of Health that the Borough Council had authorized a test of the old artesian well at the present pumping station to ascertain the capacity and quality of the water in the well, prior to determining whether the water could be made available for use in times of shortage of the supply at the spring. The Commissioner forwarded a blank application for a permit to use this well water.

The borough began a test of the artesian well supply on August 13th, and pumped continuously for 11 days at the rate of 460,000 gallons per 24 hours, ceasing to pump on August 23rd. The Department had a representative present who collected 18 samples of the well water between August 15th and 23rd inclusive of which all but 4 samples contained sewage organisms.

On August 22nd, the presence of typhoid fever and a bowel disorder having been noted, the Commissioner of Health sent a communication to the local board of health and to the water committee requesting that the public be notified to boil the water, etc. These letters were as follows:

"J. A. Leibert,
"Secretary Board of Health,
"Bethlehem, Pa.

"Dear Sir:

"I am notifying the chairman of the water committee to warn the public to boil the water on account of the prevalence of typhoid fever and bowel disorder in your town, which appears to be caused by polluted water. We have collected samples of the spring which is the source of supply and expect the results in a day or so, to confirm the physical examination of the spring, which shows sewage pollution. I wish you would co-operate with the water committee in getting out the warning notices and assist in the installation of a germicidal plant for the temporary treatment of the spring water. There is an engineer representing the Department in Bethlehem who will advise with you with respect to the installation of such a plant.

"Very truly yours,

"SAMUEL G. DIXON."

"Mr. A. B. Moore,
Chairman Water Committee,
"Bethlehem, Pa.

"Dear Sir:—

"Typhoid fever and bowel disorders are prevalent in your community and appear from investigations made by the Department's agents to be caused by water transmission. There are physical evidences of pollution of the spring which is the source of your public water supply. I advise and request you to notify the public to boil all water used for domestic and culinary purposes for 20 minutes; also that you install at once, under the advice of the Assistant Engineer of this Department who is now in your town, a germicidal plant for the temporary treatment of your water supply with a chemical. We will get confirmatory evidence by bacteriological tests of samples of your source of supply at different points in the town and will inform you further relative to the subject.

"Yours very truly,
"SAMUEL G. DIXON.

During August 22nd, engineers of the Department installed at the pumping station a chlorinated lime sterilizing plant and on the morning of the 23rd, started to operate it. The spring waters analyzed by the Department have showed the constant presence of sewage organisms in large numbers as will appear from the following table:

Department Bacterial Analyses of the Town Water Supply at the Spring.

1911.	Sample.	Bacteria per c. c.	
		Total.	B. Coli.
August 21,	Main Spring	18,000	200
August 22,	Main Spring	22,000	280
August 22,	Main Spring	3,600	210
August 22,	Main Spring	3,200	20
August 22,	Main Spring	10,000	300
August 22,	Main Spring	400	0
August 23,	Main Spring	8	0
August 23,	Main Spring	40	4
August 23,	Main Spring	800	10
August 23,	Main Spring	1,280	36
August 23,	Main Spring	1,500	60
August 23,	Main Spring	1,400	36
August 23,	Main Spring	1,120	24
August 23,	Main Spring	80	18
August 23,	Main Spring	2,800	160
August 23,	Main Spring	2,400	120
August 23,	Main Spring	2,600	200
August 23,	Main Spring	3,000	160
August 28,	Main Spring	16,200	160
August 28,	Main Spring	20,000	600
August 28,	Main Spring	18,000	52
August 28,	Main Spring	24,000	180
August 29,	Main Spring	6,000	800
August 29,	Main Spring	13,500	1500
August 30,	Main Spring	9,000	560
August 30,	Main Spring	5,000	480
August 30,	Main Spring	800	240
August 30,	Main Spring	6,500	460
September 4,	Main Spring	4,500	100
September 4,	Main Spring	1,000	160
September 4,	Main Spring	2,800	160
September 4,	Main Spring	1,400	200
September 5,	Main Spring	1,260	60
September 5,	Main Spring	2,520	80
September 13,	Main Spring	3,000	500
September 13,	Main Spring	1,400	80
September 13,	Main Spring	360	10
September 18,	Main Spring	3,600	106
September 18,	Main Spring	5,400	120
September 19,	Main Spring	....	800
September 20,	Main Spring	....	600
September 20,	Main Spring	....	80
September 26,	Main Spring	5,400	160

The drinking of such waters in their raw state would be likely to produce epidemic dysentery, and typhoid fever if th specific germ of typhoid were in the water. Inspector Matthes who went to Bethlehem to collect the samples of water from the artesian well soon learned of the prevalence of typhoid and of dysentery, neither of these diseases being reported at Harrisburg with any degree of completeness, in fact, epidemic dysentery was not reported at all until after Dr. Hunt, Associate Medical Inspector of the Department, had interviewed the physicians and ordered the reporting of the malady.

Bethlehem Borough has a population of about 12,000. That part of it (formerly West Bethlehem) supplied with water by the water company was free from typhoid or dysentery with now and then an exception and this was true also of South Bethlehem during the dysentery epidemic in Bethlehem. That part of Bethlehem east of the Monocacy Creek, which comprises Bethlehem proper and is supplied with spring water, contains about 8,000 persons. Practically every man, woman and child of this entire number were afflicted with dysentery. Many persons went without medical attention, many others procured purchasable remedies at the drug stores, some consulted a physician once only and about 400 patients were regularly attended by physicians. There were reported to the Board of Health 219 cases, and a house to house canvass of them was made by officers of the Department under Engineer Irwin, who in all interviewed 408 dysentery patients.

In the following table are given the dates of onset of the 408 cases canvassed and the dates of dysentery cases recorded in the office of the local board of health and reported to Harrisburg, and the dates reported of typhoid fever cases by weeks.

Epidemic Dysentry and Tyhoid Fever Data.

	Epidemic Dysentery.		Typhoid Fever Reported.
	Onset.	Reported.	
First week ending August 7,	19	0	1
Second week ending August 14,	45	9	2
Third week ending August 21,	158	53	14
Fourth week ending August 28,	141	112	1
Fifth week ending September 4,	35	25	1
Sixth week ending September 11,	2	6	9
Seventh week ending September 18,	....	1	18
Eighth week ending September 25,	....	9	30
Ninth week ending October 2,	....	4	12
Tenth week ending October 9,	....	....	6
Eleventh week ending October 16,	....	....	3
Twelfth week ending October 23,	....	....	6
Thirteenth week ending October 30,	....	....	2
Dates not given,	8	....	....
Total,	408	219	105

The patient had symptoms of dysentery in from 24 to 36 hours after being subjected to the infection in the water as concluded by the physicians of Bethlehem who noted the course of the malady in the new comers to town. It will appear from the above table that the great infection of the water supply occurred during the middle and last part of August. There was typhoid fever present then and in from two to three weeks thereafter there followed the large outbreak of typhoid fever. The onsets of these cases were not investigated but the above table shows substantially the progress of the epidemic.

One notable thing about the outbreak was, especially with respect to dysentery, that the cases were grouped together in the streets of the district near the pumping station where the consumers got the water soon after it left the spring and the pump, these cases, of course, referring to the patients sick enough to demand medical attention. The fact should not be overlooked that practically everybody in town was affected to some extent.

Typhoid fever has not been reported in full in the years past by the Bethlehem physicians, so that the following table does not show the extent to which this disease has been prevalent in Bethlehem. However, it is evident that prior to the fall of 1911, no water borne disease had ever been extensive enough to scare the people into a realizing sense of the dangerous quality of the spring water, although individual citizens and town committees were awake to the danger.

Typhoid Fever Cases Reported by Bethlehem Board of Health.

	1906	1907	1908	1909	1910	1911
January,	1	....	1	....	5	....
February,	....	....	1	....	1	....
March,	....	....	....	....	3	....
April,	....	....	....	4	2	....
May,	....	....	....	0	0	1
June,	....	1	....	1	1	....
July,	....	2	4	0	1	1
August,	....	4	13	1	4	19
September,	....	1	6	1	2	69
October,	4	2	11	3	6	17
November,	....	0	6	2	3	1
December,	....	1	1	0	2	2
Total,	5	11	43	12	30	110

August, 1911, was a rainy month. On the 18th a total precipitation of 1.4 inches occurred and from the 24th through to the end of the month it rained continuously, there being a downpour on the 31st of 2.03 inches. In South Bethlehem there were 9 cases of typhoid fever during August, but during September in that borough there were 67 cases, most of them having their onsets during the middle third of the month. Investigations by the Department engineers pointed to the pollution of a spring at the Bethlehem Steel Company s works used as the source of drinking water throughout the mills. This spring flowed from limestone rock at the foot of a hill on the slopes of which several thousand people resided whose sewage was deposited in the crevices of the limestone. The rains washed the pollution into the spring through underground passages as proved by serial tests of the spring waters by the Department. Of 83 cases of typhoid fever investigated in South Bethlehem, 65 were males employed in the steel mills who drank the spring water. Four of the 83 cases in South Bethlehem were traced to the polluted public water in Bethlehem. Ten other cases from outside the Borough were also traced to the polluted Bethlehem Borough water as shown in the following table:

Typhoid Fever Cases Attributed to Polluted Bethlehem Borough Water.

Patients Home.	No. of cases investigated.	No. of cases attributed to Boro of Bethlehem water.	Date of Onset of Cases.	
W. Bethlehem,	1	1	August 15,	1
Bethlehem Township,	14	5	August 19,	1
			August 20,	1
			August 28,	1
			September 5,	2
Hanover Township,	10	1	September 6,	1
South Bethlehem Borough,	83	4	September 9,	1
			September 14,	1
			September 15,	1
			September 20,	1
Lower Saucon Township,	8	1	September 29,	1
Nazareth Borough,	2	2	October 1,	1
			October 6,	1
Total,	118	14		14

Typhoid Fever Cases Attributed to Polluted Bethlehem Borough Water—Continued.

	Aug.	Sept.	Oct.	Total.
Totals—				
In Bethlehem,	19	69	17	105
Outside Bethlehem,	4	8	2	14
	23	77	19	119

The chemical germicide was applied in the form of a solution into the suction of the pump at the rate of eight pounds of bleach to a million gallons of water, was reduced the second day to 6 pounds where it was maintained except during the rainy periods when the spring became turbid. At such times the rate was increased to eight pounds. The Eagle Hotel was about 200 feet distant. At this point and in the neighborhood chlorine odor and taste was noticable in the water drawn from the tap.

On September 7th the following communications were addressed to Mr. V. V. Moore, Chairman of the Water Committee:

> "This is to notify you that the results of the bacteriological samples collected from the drilled well located between the municipal spring and pumping station within your borough, has shown the water to contain bacteria indicative of sewage pollution. The pollution was continuous during the period covered by the collection of samples. This water should not be used for domestic purposes.
>
> "Very truly yours,
>
> "Samuel G. Dixon."

> "This is to notify you that the results of bacteriological samples collected from the public water supply of Bethlehem, during a period of several weeks, show the presence of sewage organisms continually in large numbers. You have been notified to warn the public to boil all water used for domestic and culinary purposes for at least thirty minutes. This warning should be repeated at frequent intervals.
>
> "An assistant engineer of this Department has assisted you in installing a germicidal plant to sterilize the water. It is reported that some of your employes at the pumping station are either neglectful or incompetent to carry on the treatment. You should at once employ a competent bacteriologist and chemist to take charge of the sterilization of the water and install a more permanent plant. Daily bacteriological analyses should be made and reports of the results of the analyses and operation of the water works submitted to this Department. The treatment of the public water supply must be constant and efficient.
>
> "Very truly yours,
>
> "Samuel G. Dixon."

Prior to the starting of the hypo plant, three samples of water from taps about town were collected and analyzed by the Department. Each showed the presence of sewage organisms. In the following table are given the results of analyses of water samples collected at the tap on the pump and at taps about town, after the germicide was applied up to September 7th, when the attention of the borough authorities was called to the fact that their men in charge of the operation of the hypo plant were incompetent.

Bacterial Analysis of Borough Water From Taps About Town After the Hypo Sterilizing Plant Was Installed and Put in Commission.

1911.	Sample.	Bacteria per c. c.	
		Total	B. Coli
Aug. 23	Eagle Hotel,	4	0
Aug. 24	At pump,	6	0
Aug. 24	At pump,	20	0
Aug. 24	Goepp and Linden (North) Sts.,	4	0
Aug. 24	238 Goepp St.,	2	0
Aug. 24	Eagle Hotel,	12	0
Aug. 24	Goepp and Main Sts.,	2	0
Aug. 28	At pump,	8	0
Aug. 28	At pump,	2	0
Aug. 28	Eagle Hotel,	2	0
Aug. 28	Main and Broad,	1,800	36
Aug. 29	Eagle Hotel,	2,400	210
Aug. 29	Main and Broad,	1,000	280
Aug. 30	At pump,	3	0
Aug. 30	At pump,	10	0
Aug. 30	At pump,	1,800	320
Aug. 30	At pump,	1,000	300
Aug. 30	Eagle Hotel,	3	0
Aug. 30	Main and Broad,	6	0
Aug. 30	Eagle Hotel,	960	280
Aug. 30	Berkhart Store,	1,200	500
Sept. 4	At pump,	40	0
Sept. 4	At pump,	24	0
Sept. 4	Eagle Hotel,	12	0
Sept. 4	Main and Broad ,	2	0
Sept. 4	Berkhart Store,	8	0
Sept. 5	At pump,	1,800	100
Sept. 5	At pump,	1,000	80
Sept. 5	Eagle Hotel,	160	6
Sept. 5	Main and Broad,	120	10
Sept. 5	Heiser's Store,	400	0
Sept. 6	At pump (no chlorine),	240	48
Sept. 6	At pump (no chlorine),	200	30
Sept. 6	At pump (chlorine applied),	8	0
Sept. 6	At pump (chlorine applied),	1	0
Sept. 6	Eagle Hotel (no chlorine),	140	21
Sept. 6	Main and Broad (no chlorine),	320	48

On the evening of August 28th, the Worthington pump broke down and the old Cameron pump was started up without the knowledge of the Department and raw spring water was pumped into the town until the engineers of the Department became aware of the breakdown, when the chemicals were applied as formerly. This accounts for the presence of sewage organisms in the town water on August 29th.

The morning samples at the pump and taps in town showed sterile water, but the afternoon samples on the same day, August 30th, showed sewage organisms present for the reason that the apparatus was permitted to become clogged and the chemical was not reaching the water. On September 5th the same trouble occurred. On the morning of September 6th, owing to the carelessness of the attendant, no chlorine was being applied and B. Coli were found in four samples of the public supply. The Department started the apparatus and subsequent samples showed nearly sterile water. The Department had complained before this about the incompetency of the local men in charge and on the 7th of September the above letters were written, resulting in the employment of more faithful attendants.

The following letter relative to the matter written by Mr. Tice, the Borough Secretary, was received by the Commissioner of Health on September 19th:

"Dr. Samuel G. Dixon, Commissioner of Health,
"Harrisburg, Pa.,

"Dear Sir:—

At a special meeting of the town council of the borough of Bethlehem held last night, I was directed to advise your Department of the action taken by town council in reference to the carrying out of the orders made by your Department in the matter of safeguarding the health of our citizens in view of our unsafe municipal water supply. In compliance with these directions given to me, I beg to submit that the Water Committee of the Borough and the local Board of Health submitted reports which embody the findings of the State Department of Health in reference to said water supply as verbally submitted to said Committee and Health Board by Mr. Snow and Dr. Hunt of your Department, as well as the demands made by the State Board of Health upon the borough to properly safeguard the public health. The report of the water committee embodies the following recommendations to Council:

"1. The immediate installation of a proper automatic germicidal plant at the present pumping station to replace the crude plant presently there installed.

"2. The immediate employment of a competent bacteriologist and chemist to make the daily tests of the water directed to be made by the State Department of Health.

"3. The immediate organization of a select committee appointed by Town Council several weeks ago for the purpose of formulating, reporting and recommending to Borough Council a complete proposition to be submitted to the Bethlehem City Water Company for the supply of water to the borough of Bethlehem; said Committee to proceed with the duties of its appointment as outlined in the resolution creating it.

"After a due discussion by Council of the matter contained in the reports, the reports were received and council adopted the recommendations made by the water committee as above given.

"In pursuance of this action of Council, the water committee has already placed an order for an automatic motor driven self feeding germicidal plant with a Philadelphia concern at a cost of $515, which will be installed and ready for operation within 15 days from date of placing order; in the meantime the temporary germicidal plant is being maintained and is in charge of two competent men who are acting under the instructions of our borough engineer, R. E. Neumeyer. The Water Company has also engaged the services of Professor Hall of Lehigh University, who has made frequent analyses of water for different municipalities in this community and Lehigh University and who is regarded a very competent man, to make at least two tests of the water supply daily. The results of these tests will be forwarded by Prof. Hall to your Department daily. Should the Department require more than two samples taken daily, Prof Hall will do so upon being requested so to do. These bacteriological tests will be continued as long as the present water supply is used and the State Department of Health requires them.

"As to securing a new water supply, will state that the Committee having this matter in charge (the committee referred to in the third recommendation above) will organize this evening and will proceed with dispatch to ascertain what can be done in the way of making a contract with the Bethlehem City Water Company, which is presently supplying South Bethlehem and several other municipalities with water, for the sale of water to the borough of Bethlehem.

"I am enclosing herewith a copy of the report made to the town council by the water committee which will serve to show that the borough officers are co-operating with your Department in safeguarding the public health and that every effort will be made to secure a new water supply as speedily as possible.

"As soon as I am able to report some definite results of the overtures made for a water supply from the Bethlehem City Water Company, I will advise you of the same.

Very truly yours,
"Victor E. Tice,
"Borough Secretary."

The report of the water committee referred to in the above communication, was as follows:

"To the President and Members of Town Council of the Borough of Bethlehem,

"Gentlemen: "At a joint meeting of the officers of the Board of Health of the Borough with the Water Committee held on Thursday evening, September 14, 1911, the water committee received from Dr. H. J. Laciar, a verbal report in detail of the present conditions of the borough water supply, which has been under the observations of the State Department of Health for a period exceeding one month, which report as made shows that the present municipal water supply is unfit and unsafe for domestic and culinary purposes unless chemically treated. This condition is due to a manifest sewage pollution as will appear from a separate report of the local Board of Health which will be herewith submitted and the communications previously received from Dr. Samuel G. Dixon and submitted to Town Council at its last stated meeting.

"In view of all the facts which have been submitted to us we have deemed it advisable to take prompt action in bringing the whole situation before Council in order that the whole subject might be fully discussed and given the consideration its importance demands and also adopt such measures as may be deemed requisite to properly safeguard the health of our citizens, and with that object in view, we herewith submit a special report showing clearly the status of our present water supply as the same has been reported to us and embody therein our recommendations for carrying out the commands and recommendations of the State Department of Health which are concurred in by the local Board of Health.

"We find from the reports made to us verbally that the many cases of dysentery which recently existed in our borough and which had assumed the nature of an epidemic were caused by the use of the municipal water; this fact is proved beyond a doubt from what is shown by the analyses of about 125 samples of water taken at various points in our borough by the State Department of Health. All, or the greater portion, of these samples of water show the presence of bacilli capable of producing effects such as have been experienced and which are indicative of sewage pollution. From the statistics gathered, observations and tests made, there remains no doubt in the minds of the State authorities that these minute organisms found in the samples were responsible in a large measure for the greater part of the many cases of bowel disorders. The blood tests made, however, failed to disclose any case of genuine typhoid fever. It may be stated however that some of the cases of bowel disorder which have been given attention by the local physicians, are quite virulent and present many of the symptoms of typhoid fever, and the physicians who reported these virulent cases as such had ample justification for so doing, inasmuch as the symptoms of typhoid fever were so pronounced as to make it quite impossible to distinguish the same without blood tests. We find that by the use of the germicidal plant installed at the pumping station and the treatment of the water in conformity with the requirements of the State Department of Health, the spread of bowel disorder was checked and the epidemic is presently waning. The sterilization process is proving quite effective and the danger of a further spread of disease from this source is thereby reduced to the minimum. The public can, however, not be assured that the treatment of the water is an absolute guarantee against infection and this Committee again cautions the public to boil all water which is used for domestic and culinary purposes for a period of at least thirty minutes before using By doing this absolute safety is assured.

"This State Department of Health having satisfied itself from many tests made and statistics gathered, that the water heretofore used in Bethlehem Borough may no longer be used with safety without having first received a chemical treatment, has directed and enjoined the immediate installation at the pumping station of a proper and permanent germicidal plant, which is to be placed in charge of a competent person in order to procure a proper sterilization of the water supply; in addition to this, the Department has directed that the borough shall immediately employ a competent chemist and bacteriologist to take daily tests of the water and report the same to the State Department of Health. The State Department of Health further directs and commands that the borough shall at the earliest possible date, procure a new water supply as it cannot and will not permit the use of chemically treated water indefinitely and this committee has received intimations that this period may not exceed from three to four months.

"Seeing the importance of these matters and the necessity of prompt action thereon, we have carefully gone over the situation as it presents itself with the local Board of Health and with the concurrence of this body will recommend the following as the practical and proper way of coping with the situation that confronts us.

"1. We recommend the immediate installation of a proper automatic germicidal plant at the present pumping station; said plant to meet with the requirements of the State Department of Health.

"2. We, furthermore, recommend the immediate employment of a competent bacteriologist and chemist to make the daily tests of water which are directed to be made by the State Department of Health.

"3. We should furthermore recommend and urge that the Select Committee appointed by Council several weeks ago for the purpose of formulating, reporting and recommending to Borough Council a complete proposition to be mitted to the Bethlehem City Water Company for the sale of water to the borough of Bethlehem, etc., etc., organize without any unnecessary delay and proceed with the duties of its appointment as outlined and embodied in the resolution creating it.

"Respectfully submitted,
"V. V MOORE,
"FRANK J. HANKE,
"EDW. J. KRAUSE,
"JOHN W. CLARK,
"Water Committee of Borough of Bethlehem."

Prof. Hall took responsible charge of the hypo plant on September 20th. The Department continued to collect samples and analyzed the treated waters. On September 27th, October 26th, and November 23rd the tests showed the presence of B. Coli. This was attributed to the carelessness of the attendants. Those found inefficient were dismissed. These experiences have proven the limitations of chemical sterilization as a barrier to the transmission of sewage organisms in water. The efficacy of the process depends almost entirely on the faithfulness of the attendant.

Temporary Supplies.

The Bethlehem Silk Mill is located along Monocacy Creek about a half-mile upstream from the borough pumping station. For a number of years past recourse by the town has been had to a drilled well supply at the mill. Formerly the mill company's pump was used to force water into the borough's water works system when, for any cause, more water was needed than could be supplied by the town's pumping station. After a while this pump became worn out and the borough put in a new pump at the mill and has since paid the company to operate it. The well is sunk about 390 feet in limestone and is an 8-inch bore at the bottom.

In July of 1911 this pump was operated on five different days, a total of 48 hours, and in August on seven different days, a total of 91½ hours. This supply was shut off on August 25th by orders of the Department because of suspicion as to the purity of the supply, which suspicion was confirmed by bacteriological analyses of the water. Out of 14 samples collected between August 28th and October 12th, inclusive, 6 samples showed the presence of sewage organisms, although not in large numbers, the greatest in any one sample being 4 B. Coli per c. c.

The Department supervised the installation of a hypo plant at the mill and on October 10th, and thereafter, when necessary, this supply was used, the water being treated.

On October 14th, the drilled well at the borough pumping station was used by permission of the Department to supplement the spring, since the water from the well contained fewer sewage organisms than the water of the spring. Of course the well water was subjected to chemical treatment at the pump.

Proposed New Permanent Supply.

The borough proposes to build a concrete masonry pit on the Illick Mill property owned by the town between the mill race and the creek and have it deep enough so that the water from the race will flow by gravity to the receiving chamber, if this should ever prove necessary; but no connection is now proposed to the mill race or creek. This pit is to have a flat reinforced concrete roof, the level of which is to be above the high water of the creek. One-half of the pit is to be used as a receiving chamber and the other part over which a peaked roof is to be constructed, is to house the pump and air compressor. It is intended to utilize the natural flow from the well but in case this should be insufficient, a greater yield is to be developed by compressed air. In case the air compressor should be put out of commission, the town might be short of water. Because the borough has an unused, new centrifugal pump it is proposed to install it. If any accident should put this pump out of commission, the town would also be without water. The local authorities have in mind, as a last resort in necessity, recourse to the mill race water. The Department looks with suspicion upon the supposed purity of the waters yielded by the wells. The creek waters are of course unsuitable as a source of public supply unless filtered. Furthermore, and since there is scant pressure and storage for fire purposes in town, it is evident that duplicate machiney should be provided at the new pumping station. It will be economy for the town to install a power pump of approved type for ordinary use and reserve the centrifugal pump for emergencies. The saving in cost of power alone should compensate for the outlay for the additional pump.

It is represented that the town has available a fund of $20,000 to defray the cost of the new works. On the line of the force main which is to be 20 inches in diameter is the site upon which it is proposed ultimately to provide additional storage.

Between the dates of September 7th and November 16th, on 15 separate days a total of 64 samples of water were collected from the Illick Mill wells and in none of them were sewage organisms found, the total count also being very low. On three of these days when samples were collected forenoons and afternoons totalling 16 in all, water was being pumped from the well, these three days being at the end of a ten-day test mentioned in the application of the borough. However, this is no proof that a continued pumpage of water from the wells might not produce water polluted with sewage. To be safe a hypo plant should be installed at the Illick Mills pumping station and bacterial analyses of the waters made twice weekly or more frequently if necessary. The borough should be in a position to immediately treat the water chemically if occasion should arise

Chemical analyses of the well waters show them to be characteristic hard waters. The town authorities represent that the citizens have always been accustomed to such hard waters and that they are preferred as expressed by the majority vote of the townspeople. Furthermore, the new supply can be introduced within a few weeks and thus accomplish the abandonment of the existing spring and wells which are condemned.

Conclusions.

A formal application will be forthcoming and the Department will grant a permit without doubt, embodying substantially in its stipulations the above requirements.

23. TYPHOID FEVER AT BLOOMSBURG.

The following report is on the operations of the Engineering Division at Bloomsburg, Columbia County, Pa., with respect to the water supply during the fall of 1911. It gives the conditions on the watershed above the intake and concludes with the present situation requiring the filtration of the supply.

Assistant Engineer Ralph E. Irwin installed the hypo plant at Bloomsburg pumping station. He exercised the general supervision of the Department's operations relative to the water works system in the field From his report the following account of the typhoid outbreak has been prepared.

Typhoid Outbreak.

On request of Dr. J. E. Shuman. Secretary of the Board of Health of Bloomsburg, that the Department send an engineer to examine the drinking waters in the village of Morgantown, a part of Bloomsburg borough, where there were several cases of typhoid fever, Inspector Styer went to Morgantown and collected samples on September 6th and 7th, and Dr. Arment, County Medical Inspector, collected samples which were received at the laboratories on September 20th. Mr. Irwin of the Engineering Division went to Bloomsburg on September 24th and installed a chlorinated lime treatment plant at the Bloomsburg Water Company's station. Inspector Wanbaugh remained to operate the plant and to collect samples, the last being collected on September 28th. There were 15 cases of typhoid fever investigated that occurred between the dates of June 15th and September 29th. Nine of these were in the village of Morgantown where borough water was not supplied. Morgantown consists of two parallel rows of houses on either side of a highway, eight in one row being single houses and eight in the opposite row being double tenements of the poorest kind, in fact, little more than hovels in which the sanitary conditions were of the lowest. The yards were in a filthy condition and it is strange that any one of the 24 families in this settlement should be free from the ravages of disease at any time. The water supply was procured at one place from the end of a pipe "goose-necked" in shape, out of which water flowed continuously, being led from a spring housed over and located far up the hillside away from contamination with nothing above it but open land used for pasturage.

One of the Morgantown cases occurred on June 15th, three of the others had their onset about August 20th, one on the 26th, and in September the onsets were on the 1st, 6th, 7th and 14th. The cases on the 6th and 14th followed prior cases in the same houses of dates of August 21st and 26th. About one person out of every 15 inhabitants of the village was afflicted with the disease. All waste water from the houses went into the road gutters and ditches leading down the slope to the mill race. The avenues of transmission of infection were numerous. The water company owns these properties and this company voluntarily cleaned up the premises, dug 24 new vaults, spread lime in liberal quantities in the gutters and ditches and put lime in the spring on the hillside, which it also owns. The door of the spring house was kept under lock. The engineers made tests and found the pipe line intact. No water along the line could leak into this pipe and none flowed out except as intended at the end. The following are baceriological examinations made by the Department of samples of the water taken at the spring and also collected at the end of the pipe, designated "goose-necked." By these tests it will be seen that out of four samples taken at the spring, one only showed slight pollution. The first two samples were collected after the drenching rains of the week and should have shown contamination had they been washed from the surface of the fields. Two out of six samples of the water at the "goose-neck" showed B. Coli present.

The side hill back of the double row of houses is quite steep and full of water which seeps out in numerous places and here a short distance only from the houses are certain springs and shallow wells used by Morgantown citizens. The samples collected of these waters on September 6th and 7th and analyzed showed contamination as will also appear in the following table:

Morgantown Drinking Water.

Collected.	Sample.	Bacteria per c. c.	
		Total	B. Coli
1911.	Morgantown Spring.		
Sept. 6th.	At spring,	2	0
Sept. 7th.	At spring,	12	0
Sept. 27th.	At spring,	30	1
Sept. 28th.	At spring,	6	0
Sept. 6th.	At goose-neck,	8	0
Sept. 6th.	At goose-neck,	0	0
Sept. 7th.	At goose-neck,	20	6
Sept. 7th.	At goose-neck,	40	2
Sept. 27th.	At goose-neck,	12	0
Sept. 28th.	At goose-neck,	12	0
Sept. 6th.	Keller's well,	600	18
Sept. 7th.	Keller's spring,	140	4
Sept. 7th.	Lloyd's well,	1,200	280
Sept. 7th.	Hartzell spring,	360	18
Sept. 27th.	Hartzell spring,	120	4
Sept. 6th.	Metz spring,	30	2
Sept. 7th.	Metz spring,	140	3
Sept. 7th.	Metz spring,	26	4
Sept. 27th.	Metz spring,	6	0

On September 12th, 1911, the Commissioner of Health sent the following communication to the local health authorities with respect to these drinking waters:

"J. E. Shuman, M. D.,
"Secretary Board of Health, Bloomsburg, Pa.

"Dear Sir:—Enclosed find copy of analyses of samples taken by Mr. Styer on the 6th and 7th inst. You will observe that a large number of the samples show sewage pollution. The owners of the Keller, Metz and Hartzell private wells or springs should be notified of the pollution of the supplies and warned not to use the water without boiling until such time as the sources of the pollution have been ascertained and removed. The well of Mrs. Lloyd is so situated as to be liable to serious pollution and the result of the analyses of Sample No. 11 confirms this view. This well should be condemned and closed. Samples taken at the trough supplied by the Morgantown spring on the 7th show pollution, while all the samples at the source show up well. It is suggested that there may be leakage into the pipe of polluted ground water and if leakage occurs it could be ascertained readily by plugging the pipe at the spring and observing whether or not there is a continued flow of water from the spring head. If such is the case the pipe from the spring should be replaced by a new pipe. Could you find time to make this simple test or have it made.

"I trust that you may be able to comply with my request regarding the test of the Morgantown Spring.

"Thanking you in advance, I beg to remain,

"Yours very truly,
(Signed) "SAMUEL G. DIXON."

The water company closed up the Keller, Hartzell and Lloyd springs. The Metz spring is about half way between Morgantown and the borough centre. There was a case of typhoid fever in the residence that explains why the sample was collected. The owner would not close the spring but desisted from using the water for drinking purposes as a supply for the neighborhood.

Of the six typhoid fever cases in the borough, all were supplied with borough water, three were widely separated and three were in adjoining houses, one being secondary on September 29th and the two primary cases being September 8th. Of the widely separated cases in the borough occurring August 31st, September 1st and 7th, the one first mentioned was that of a traveling salesman, who had drunk of numerous supplies while away from Bloomsburg. It is also probable that the nine patients in Morgantown got borough water when in town.

The public supply furnished by the Bloomsburg Water Company is from Fishing Creek, being taken through a cast iron intake 18 inches in diameter that leads from a substantially built chamber consisting of a concrete and iron roof flat and resting on walls of heavy stone, so placed in the rapids of the stream as to form protection for the intake pipe, to the pump well from which the water is raised into three concrete reservoirs on the hill, one being at a higher elevation from which the water flows to the State Normal School, constituting a high district service and the other two being twin basins from which the major portion of the town is supplied.

The tap water is turbid whenever the creek water is turbid for any length of time. Considerable sediment settles out in the reservoirs. On September 7th the samples of the creek water and from faucets about the town, collected by the Department contained considerable sediment in suspension, were discolored and had sewage organisms present. The creek flow was above the normal and its waters were turbid resulting from the heavy rains of the past week.

Quality of Tap Waters in Town Supplied by Water Company.

Collected.	Sample.	Bacteria per c. c.	
		Total	B. Coli
1911.			
Sept. 7th.	Tap at pumping station,	420	3
Sept. 7th.	Sam. Metz residence,	120	8
Sept. 7th.	Joseph Casey residence,	210	6
Sept. 7th.	Adams Express office,	400	80

These analyses show the public water to be dangerous at times. The water company treated the reservoir waters with copper sulphate solutions on September 9th, 12th and 20th. The high service reservoir holds half a million gallons. The twin reservoirs hold five million gallons, the larger having a capacity of 3½ million gallons. On and after September 26th all of the water pumped was treated with a solution of chlorinated lime in the proportion of one part of powder to a million parts of water by apparatus set up in a hasty manner by the Department's engineers and operated under their direction until about the first of October. During this period of State supervision, the waters drawn from the taps in the town showed absence of all sewage organisms, but afterwards the treatment was not so efficient, judging from the falling off in the quality of the samples collected about the town on October 16th. In the following table are given the results of examinations of the reservoir waters after treatment with copper sulphate, the raw waters of the creek, the treated waters drawn from taps in town during the time the Department supervised the sterilization process and such tap water after the Department relinquished the operation of the process to the water company.

Reservoir Waters After Treatment With Copper Sulphate.

Collection.	Sample.	Bacteria per c. c.	
		Total	B. Coli
1911.			
Sept. 19th.	Res. No. 1 cap. 1,500,000 gals.,	....	0
Sept. 25th.	Res. No. 1 cap. 1,500,000 gals.,	70	0
Sept. 19th.	Res. No. 2 cap. 3,500,000 gals.,	....	0
Sept. 25th.	Res. No. 2 cap. 3,500,000 gals.,	60	0
Sept. 25th.	Res. No. 3 high service,	10	0

Raw Water From Creek.

Collected.	Sample.	Bacteria per c. c.	
		Total	B. Coli
1911.			
Sept. 7th.	Tap at pumping station,	420	3
Sept. 25th.	Tap at pumping station,	116	0
Sept. 25th.	Tap at pumping station,	240	1
Sept. 27th.	Creek water,	200	0
Sept. 28th.	Creek water,	260	0
Sept. 28th.	Creek water,	250	5
Oct. 16th.	Tap from pumping station,	30	2
Oct. 16th.	Tap from pumping station,	16	2

Treated Water From Taps in Town During Time the Department Supervised Operation of the Sterilizing Process.

Collected.	Sample.	Bacteria per c. c.	
		Total	B. Coli
1911.			
Sept. 27th,	Exchange Hotel,	120	0
Sept. 28th,	Exchance Hotel,	10	0
Sept. 27th,	Pumping station,	10	0
Sept. 27th,	Pumping station,	20	0
Sept. 28th,	Pumping station,	14	0
Sept. 28th,	Pumping station,	8	0
Sept. 27th,	Adams Express office,	40	0
Sept. 27th.	Savidge Store,	10	0
Sept. 28th,	Mayer Bros. Store,	60	0
Sept. 28th,	Third and Center Sts.,	84	0
Sept. 28th,	241 Center St.,	70	0

Tapped Water in Town After the Department Relinquished Operation of the Sterilizing Process to Water Company.

Collection.	Sample.	Bacteria per c. c.	
		Total	B. Coli
1911.			
Oct. 16th.	Treated water at pumping station,	40	1
Oct. 16th.	Treated water at pumping station,	48	3
Oct. 16th.	Gunns Drug Store,	30	2
Oct. 16th.	Duns Store,	80	2
Oct. 16th.	Palmers Hotel,	20	0
Oct. 16th.	Mellons Hotel,	12	0
Oct. 16th.	Public school, Second Ward,	30	0
Oct. 16th.	Nagle livery,	24	0
Oct. 16th.	Beech Avenue School,	10	0

The Commissioner of Health on September 26th, 1911, ordered the Bloomsburg Water Company to prepare and submit for approval plans for a modern filtration plant. The correspondence was as follows:

"Bloomsburg Water Company,
"George Walliver, Superintendent,
"Bloomsburg, Columbia County, Pa.

"Dear Sir:—This is to notify you that it has been determined to be prejudicial to public health for your company to furnish water to the public from Fishing Creek unless the same be treated in a modern filtration plant. It becomes my duty to notify you to prepare and submit to this Department plans for a modern filtration plant to treat the water supplied by your company to the public. The Department will be very glad to advise and co-operate with you in the preparation of these plans. Failure to comply with this request will be met by placing the entire subject in the hands of the Attorney General.

Yours truly,
(Signed) "SAMUEL G. DIXON."

"Bloomsburg, Pa., October 2, 1911.

"Samuel G. Dixon, Commissioner, Harrisburg, Pa.

"Dear Sir:—In regard to your letter of September 26th in reference to the filtering plant would say that I have shown the same to some of the members of our Board and as we are nearing the time for our yearly election of directors we have deferred taking action, in regard to this matter, until the new Board is elected, at which time it will be given prompt attention.

"Trusting this will be satisfactory, we remain,

"Yours respectfully,

"Bloomsburg Water Company,
(Signed) "C. W. McKELVEY, Sec."

"Harrisburg, Pa, October 24, 1911.

"The Bloomsburg Water Company,
"C. W. McKelvey, Secy., Bloomsburg, Pa.

"Dear Sir:—I beg to call your attention to my letter of September 26th and to inquire what progress you are making with respect to plans for modern filtration plant as called for in said communication.

"Yours truly,
(Signed) "SAMUEL G. DIXON."

Watershed.

Fishing Creek drains a very hilly watershed that until recently was quite heavily wooded. Most of the timber has been removed. There is a railroad used for passenger service extending along the East and West Branches. Millville, population 638, is on the West Branch near the head waters, 22 miles above Bloomsburg. On the East Branch is Benton borough, 635 population and Jamison City, a village of about 500, located above Bloomsburg 15 and 20 miles respectively. The total area drained by the stream is over 500 square miles. There are numerous villages and in 1909 the Department made a sanitary survey in the townships and villages and found 3,316 occupied properties including the boroughs in which resided a total of 12,854 persons. Abatment notices for cases of stream pollution were issued and followed up.

In October of 1911 the Department again began a sanitary survey of the watershed at those properties where pollutions existed two years previous and also in the boroughs.

Millville has a public water supply and a sewer system The Millville Water Company obtains water from drilled wells but they are inadequate in capacity and the raw water from the creek is permitted to enter the drilled wells during the summer months from which the water is pumped to a concrete distributing reservoir. There are about 50 properties served with this water. There are in the borough 18 springs and 120 wells used by the inhabitants for domestic purposes.

The borough's sewer system was installed about 10 years ago and connected thereto are about 92 properties. It has an 8-inch outlet into the mill race below State street in the heart of the village. A permit to extend the sewer system was refused by the Department. The woolen mill discharges wool scourings into the same mill race and the wastes from the tannery were also found in October of 1911 to be discharging into the mill race. An unsuccessful attempt had been made to filter this waste through a small bed of limestone, sand and charcoal.

At Benton borough there is no sewer or water system, but a sewer from the McHenry house discharged into the creek. Since then an attempt has been made to provide a percolating cesspool. Out in the township is the large distillery of the McHenry's from which refuse is discharged into the stream.

At Jamison City the Elk Tanning Company operates a tannery of a capacity of 350 hides daily. The tannery wastes pollute the creek. With these exceptions and a few other private properties, the waters of the creek are fairly free from sewage contamination except such as may occur from the railroads.

Discussion.

The question is being debated in the minds of the officers of the water company whether by careful attention to the disposal of the sewage on the watershed of Fishing Creek by the State Department of Health, supplemented by the treatment of the water with chlorinated lime at the pumping station by the water company a sufficient safeguard to public health will not be afforded. There is some ground upon which to debate the question since Bloomsburg seems to have been quite free from any wide-spread epidemic of a water-borne character in the past attributable to the use of raw creek water. However, if the attention of the public of Bloomsburg demands some treatment of the water, such treatment should be in fact as well as in theory, a reliable one. The use of a germicide in the opinion of the Department is not as reliable a safeguard as filtration of the water would be.

24. TYPHOID FEVER AT ERIE.

On Friday, January 27th, 1911, the Commissioner of Health instructed the Chief Engineer to go to Erie, Pa. to examine into the cause of an outbreak of typhoid fever alleged to be due to the pollution of the public water supply and to enforce such measures as might be necessary to suppress the outbreak and prevent its recurrence. The Chief Engineer was accompanied by Assistant Engineers Wm. H. Ennis and Ralph E. Irwin. They arrived Saturday morning in Erie. The force was added to from time to time until it numbered twelve engineers and inspectors. Under the advice and supervision of the Commissioner of Health a temporary hospital was provided by the city and extra nurses were employed. Altogether before the outbreak was suppressed there had been recorded 1,078 cases of typhoid fever and 131 deaths. The following report deals with the operations of the Engineering Division of the State Department of Health and those matters more directly dealt with by the Commissioner of Health through the engineering force.

PART I. EVENTS ANTECEDING THE COMMISSIONER OF HEALTH'S OPERATIONS OF 1911.
1. City's Call for Assistance of State Department of Health.
2. Prior Water Works and Sewerage Decrees.
    a. Water Works Decree.
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PART I. EVENTS ANTECEDING THE COMMISSIONER OF HEALTH'S OPERATIONS OF 1911.

1. City's Call for Assistance of State Department of Health.

On January 24th, the Commissioner of Health sent the following communication to the Erie Board of Health. At the time several hundred cases of typhoid fever existed in the city but this was unknown because the doctors were negligent in reporting the cases. However, the situation was considered serious and the Commissioner of Health offered his services:

"Your morbidity report for the month of January shows 69 cases of typhoid fever. This is indeed a serious matter for a city of the size of Erie. We are writing to inquire whether you have located the cause of the outbreak and to learn what you are doing toward stamping out the infection. Permit us in this connection to call your attention to a few of the things the Department has found of great advantage in handling outbreaks of typhoid fever.

"In the first place, it is absolutely essential to have all physicians treating typhoid cases report them to your Board in writing at the earliest possible moment after the diagnosis is made, and any physician neglecting to report forthwith as required by the Act of May 14, 1909, should be prosecuted, and for a second offense should be heavily fined.

"As you know, the Act of May 14, requires your Board to placard every house in which typhoid fever is being treated. We have found it of great advantage in epidemic work to hand to the householder in such premises at the time the placarding is done a circular, similar to the one which we enclose with this letter, outlining the details of concurrent disinfection that should be practiced by the nurse and attendant. The secret of preventing secondary cases in the household lies in attention to these details.

"The Health Officer, at the time he placards a house, should be instructed to make a most careful sanitary inspection and note in writing every detail about the condition of the privy and cesspool, and he should report to your Board how the excreta are being disinfected and if efficient methods are not being practiced he should instruct the householder in proper methods for disinfecting such discharges and in safe methods for their ultimate disposal. Many times the health officials can with advantage furnish lime and chemicals to the poor for this purpose.

"In every case where the family is an indigent one and it is possible to secure permission, the patient should be transferred to a hospital if his condition justifies removal. Where removal of such cases is impossible, intelligent nursing may often be advantageously given by someone in the employ of the local Board of Health.

"Warning placards should be posted at conspicuous places throughout the town, preferably on telegraph and telephone poles, urging citizens to boil every bit of water used for drinking purposes.

"If any public springs or wells still in use are believed to be polluted, warning signs should be posted, similar to the one which we are mailing you.

"A most important thing that is often overlooked is that of serving milk in the household. The housewife should be instructed to set out a container to receive the milk, and the dairyman, whether he be a retail man with a wagon or the next door neighbor, should be strictly enjoined to pour the milk into the container without touching it. Any milk bottles found on the premises should be kept there until disinfected by your Health Officer and their release authorized by the Health Officials.

"Meats, vegetables, etc., should not be handled by persons in the household with typhoid unless it is for the consumption in that house. The common practice of the good housewife handling meat at the rear end of the delivery wagon often carries the infection far beyond its original source.

"If the municipal supply of water is at fault immediate provision should be made for treatment of this supply by means of copper or hypochlorites until such time as a suitable and permanent system of purification may be installed.

"We have found it best to try and prove the source of infection by making a careful census of all cases, using cards similar to the one which we enclose, in which the customs and movements of every patient sickening are carefully traced as individuals, and by checking up the total number using certain food stuffs, milk or water in common By some such system you can determine very accurately the source of the infection and issue warning accordingly.

"If the Department can be of further service to you, we will be very glad to lend our aid.

Yours very truly,
(Signed) SAMUEL G. DIXON,
Commissioner of Health."

The city on the following day requested the Commissioner of Health to assume full control of the situation in the following communication:

"Erie, Pa., January 25, 1911.

"Dr. Samuel G. Dixon,
"Commissioner of Health, Harrisburg, Pa.

"Dear Doctor:—I desire to call your attention to the typhoid record of this city since December 1, 1910. The number of cases in December having been thirty-one with two deaths and from January 1, 1911 to the present time, one hundred and forty-one cases, with twenty deaths.

"Four analyses of the water, three at the request of this Department and one at the instance of a local newspaper, were made by Mr. James A. Evans, Chemist to the State Department of Agriculture, and have, in each instance, shown the presence of the colon bacillus. As the city of Erie has no official Bacteriologist, detailed efforts to isolate the bacillus typhosus have not been made by the Board of Health, but as the disease is general throughout every section of the city and repeated investigations of the milk supply have failed to trace it in any instance to that source, we believe that the water is the cause of the outbreak. In addition to this, analyses of the different local spring waters and samples of ice have also been made with negative results.

"The local Board of Health has repeatedly urged upon the people the absolute necessity for boiling all city water for drinking and other domestic purposes and have taken such other steps as appeared to be indicated, but to date do not seem to have accomplished much by their efforts.

"The members of our Board of Water Commissioners are appointed by the President Judge of the County, under a special act of legislature, and are in no way responsible to the local authorities. They insistently maintain that the water is not contaminated and they are in no way responsible for the outbreak.

"Have you any suggestion to offer as to the steps that may be taken by us to check the epidemic? Would you not consider it advisable for your Department to take this matter in hand, make a thorough survey of conditions existent here, and if necessary, assume full control of the situation?

"Very truly yours,
(Signed) "J. W. WRIGHT,
"Health Officer."

It is important to note as an antecedent to the typhoid fever outbreak, the outbreak of what was locally termed "winter cholera." Dr. J. W. Wright, the local health officer, when requested by the Chief Engineer of the Department to make a written statement about the cholera, submitted the following:

"About December 15, 1910, I was informed by a number of our physicians that they were being called upon to treat a form of enteritis, unusual in their practice, which presented the following symptoms:

"A sudden onset with an absence of all evidences of a slow infection, the symptoms present being abdominal pain of greater or less severity, followed within a period of two or three hours by profuse diarrhoeal discharges, offensive in character and accompanied by much flatus. These discharges were very frequent in occurrence, and under ordinary conditions, usually ceased after a period of from thirty-six to forty-eight hours.

"In the great majority of cases prostration was not noted, the patient being able to attend to his usual vocation. In a few instances, however, the disease assumed a more severe type and was accompanied by headache, fever, loss of appetite and a degree of prostration which occasionally required the sufferer to take to his bed. In the more severe cases, bloody stools were often noted, the disease assuming the character of a colitis, the period of duration in such instances being usually about one week.

"A personal interrogation of the physicians practicing in this city leads me to believe that at least one-third of our population suffered from this condition, at the time referred to.

"At a later period, corresponding approximately to a similar date in January, 1911, a recurrence of this outbreak was noted, the disease being of a more severe type than was noted in the previous one, but not affecting nearly as great a number of people as were afflicted at that time.

"A similar series of interrogations, as previously noted, were again instituted, with the result that the best information at our hands would indicate that fully thirty thousand people suffered from this complaint, during the entire outbreak."

In his report to the Board of Health for the year 1911, Dr. Wright had the following to say about the winter cholera:

"To more fully understand the typhoid epidemic that recently devastated this community, it is necessary to refer to the outbreak of winter cholera which first appeared in December, 1910, and again recurred in January of the present year.

"Shortly after December first, and following a series of severe northeast gales, the city water became unusually turbid, and on settling, deposited a dark heavy sediment which had a foul order and was distinctly slimy in appearance. Almost immediately after this condition was noted, a marked outbreak of acute enteritis appeared in all parts of the city, which, as influenza was existent to a mild degree, was characterized as intestinal grippe by physicians generally, and outside of the health authorities was not considered as being in any way due to water pollution."

This disease clinically presented the following picture:

"A sudden onset with none or slight constitutional disturbance, the attack being characterized by severe griping pains, followed in a few hours by frequent watery stools, the discharge being very offensvie and accompanied by much flatus. In the more severe form, a moderate rise in temperature was noted, and the other symptoms above referred to assuming a more aggravated character and the stools becoming bloody and containing much mucus. Mild cases usually recovered within two or three days after their onset, but in the more severe forms, from ten days to two weeks frequenly elapsed before health was completely restored. In the extremes of life, especially among the very young, a number of fatalities occurred, such cases presenting symptoms of profound toxemia

"Cases presenting these symptoms were first observed about December 10th, and so rapidly increased that fully one-third of the population of the city was affected before the month ended.

"On the appearance of this affection, the Board of Health repeated its warnings that the water was impure in its raw state and urged its thorough boiling before its use for culinary and drinking purposes.

"About the 15th of this month (December) the number of reported cases of typhoid increased to a marked extent, twenty-five being recorded between that date and January 1, 1911, as compared to six for the fifteen days previous.

"During this period the department persistently called the attention of the public to the water as a probable source of existing conditions; in fact it was regarded by your Board as the only cause, it being obvious that only a common cause could so generally affect the health of the whole community.

"In spite of repeated warnings, the disease spread rapidly, the first half of January showing eighty-seven new cases with the number increasing daily. At this junction samples of water were referred to Chemist J. A Evans, who soon reported the presence of B. Coli, thus conclusively demonstrating the source of the infection.

"Conditions continued to grow worse with great rapidity and the outbreak of winter cholera noted in December, again made its appearance in a more severe form adding many thousands to its list of victims; a conservative estimate of cases of this condition, made after a careful canvas of the city showing that nearly or quite one-half of our total population suffered from it.

"The control of the public water supply being absolutely beyond the power of your Board, it became apparent that more active measures must be instituted if any hope of suppressing the epidemic was to be entertained. To this end a statement of existing conditions was made to Dr. Samuel G. Dixon, State Commissioner of Health, who on January 28, dispatched Mr. F. Herbert Snow, Chief of the Division of Engineering and Dr. B. Franklin Royer, Chief Medical Inspector, with a corps of assistants, to take charge of the situation."

2—Prior Water Works and Sewerage Decrees.

a—Water Works Decree.

On April 29th, 1908, the Commissioner of Health issued an order to the city of Erie, Pennsylvania, to prepare plans for the collection of the sewage of the entire city and for the treatment of such sewage, and that such plans shall be submitted to the State Department of Health for approval on or before the first day of November, 1908. A full copy of the communication is as follows:

"To the Honorable the Mayor, and City Council of the City of Erie,
"Erie County, Pa.

"Gentlemen:—Not long since several hundred citizens and taxpayers of your city petitioned the State Department of Health to make an investigation and report some corrective measures for the pollution of Mill Creek and Garrison Run. This Department has made such investigation, and I have determined that the interests of the public health demand that sewage shall cease to be discharged into the waters of the State by the City of Erie. I hereby notify and request you to prepare a comprehensive plan for the collection of the sewage of the entire city and for the treatment of such sewage, and that such plans shall be submitted to the Commissioner of Health for approval on or before the first day of November, 1908.

"The Board of Water Commissioners will be requested to submit detailed plans of their plant and make application for extensions to the system. To be absolutely safe water consumers should boil all water used for domestic purposes.

"The City Board of Health will be informed that the use of ice harvested from the bay where such use brings the ice in contact with food stuffs or drinkables, is dangerous and should be prohibited. Said Board will be requested to exercise a supervision over the traffic of this ice, to have regular analyses made of the ice during the summer seasons and to be guided in its action regulating such traffic and its use by the result of these analyses.

"Field inspectors from the State Department of Health will be sent into Erie County to stop the discharge of sewage into any of the streams flowing through agricultural regions along which cattle are pastured, more particularly in the vicinity of Erie City.

"The County Almshouse authorities will be required to remodel the sewage disposal plant at that institution. Attention to the various private sources of sewage pollution along the harbor will be given when plans shall have been adopted for the discontinuance of the city sewage into the harbor.

"Your particular attention is called to the discussion of the entire subject, as set forth in a report to H. Hendricks, Secretary, Joint Committee on Mill Creek and Garrison Run pollution dated April 28th, 1908, and made by the Commissioner of Health of Pennsylvania, a complete copy of this report is enclosed herein.

"Yours truly,

(Signed) "SAMUEL G. DIXON."

At the same time the water commissioners were requested to warn the public to boil the water in the following communication:

"April 29th, 1908.

"To the Board of Water Commissioners,
"Erie City, Erie County, Pa.

"Gentlemen:—I hereby request you to submit detailed plans of your water works system and to make application for extension of the system. To be absolutely safe, water consumers should boil all water used for domestic purposes. These matters and others relating to the pollution of Erie harbor and the city water supply are taken up in detail in a discussion, dated April 28th, 1908, and submitted by the Commissioner of Health of the Commonwealth of Pennsylvania to H. Hendricks, Secretary, Joint Committee on Mill Creek and Garrison Run pollution, in response to a petition from several hundred of the citizens and tax payers of the city. I herein enclose a complete copy of this discussion.

"Yours truly,

(Signed) "SAMUEL G. DIXON."

b—State's Advice Relative to Harbor Pollution.

Prior to this time the position which the State Department of Health had taken respecting the discharge of sewage into the harbor had been stated in the reply of April 28th, 1908, to the joint committee on Mill Creek and Garrison Run pollution. This reply was as follows:

"Erie Harbor would be a stagnant body of water were it not for the effect of wind and the slight outward movement at the harbor mouth due to the inflow from the 26 miles of watershed tributary to the bay and from the sewers. The currents produced by wind action are sometimes strong. The lake has been known to rise and fall three feet during and after a storm. This produces a very considerable tide in and out through the harbor channel. At other times the winds are also the producers of currents. It is a well-known fact that they may extend their influences readily to a depth of 12 feet below a lake surface and even to a much greater depth. The area of the harbor is approximately 5.7 square miles, of which 2.5 square miles have a depth of water of 12 feet or less. Consequently this shallower portion is not an ideal subsidence basin. While the heavier suspended matters may settle, the lighter ones are liable to be kept in suspension for an indefinite period. This is true but to a less degree in the remaining part of the harbor. The water is 18 feet deep or more and extends over a surface area of 2.4 square miles.

The detention in the bay of sewage matter whether it be on the bottom or suspended or in solution must be of long duration. While the opportunities are favorable in the immense body of water, (approximately fifteen billion gallons) for oxidation of the organic matter discharged into the Bay, and for destruction of micoorganisms, the ability of pathogenic germs to survive for weeks during which they may be carried back and forth by the winds and currents, renders the discharge of sewage into the Bay a menace so long as water be drawn therefrom for domestic uses.

"It is estimated that the drainage from the houses in the city now discharged into the Bay is a volume equivalent in a year's time to one-quarter of the entire contents of the Bay. There has been a number of months when the mingled sewage and storm water discharged from the city of Erie alone has been equivalent to one-third of the Bay's capacity. At this rate the waters of the bay would be replaced four times annually by such discharge from the city of Erie territory.

"These statements may convey, though inadequately, some idea of the absolute necessity of radical change in the use of the harbor as a repository for sewage. Now an emergency intake anywhere in the Bay cannot be maintained with safety to the public health. Even if the water should be filtered, a temporary breakdown of the purification plant might precipitate a fatal epidemic by reason of the introduction of sewage water into the city's service mains.

"The city is favorably located on trunk railroad lines which give it ideal railroad transportation facilities to the east, west and south. The erection of the Pennsylvania General Electric Company's new plant in the outskirts of the city on a site laid out to accommodate an ultimate population there of 50,000 people is bound to produce a marked effect on the future growth of Erie. The water consumption will increase and the sewage pollution of the harbor will increase unless some other disposal be found. The nuisances now existing along the shore will become worse if remedies are not forthwith applied.

"These considerations have been deliberated by the Commissioners of Water Works of the city who have deemed it their bounden duty to go beyond the harbor and seek an additional and new supply from the lake itself. The ultimate clarification of the lake water, which is sometimes quite roily, has been contemplated in the plan, and the settling basins hereinbefore mentioned have been tentatively laid out. If finally it should become necessary to filter the water, the commissioners have thought it safer and better that such lake supply should be filtered instead of the sewage polluted bay water. Hence the board has sought the purest supply obtainable; but to insure against accidents to the lake intake the plans have necessarily involved an emergency intake within the harbor. Consequently the problem of sewage disposal for the city of Erie not only includes remedies for nuisances in Garrison Run and Mill Creek and along the harbor front, but it includes also the more vital problem of ample protection of the city's drinking water.

"There is no point in the harbor where crude sewage can be safely emptied. THE DEPARTMENT IS NOT AWARE OF ANY POINT OUTSIDE OF THE HARBOR WITHIN A REASONABLE DISTANCE WHERE THE SEWAGE OF THE CITY CAN BE PERMANENTLY DISCHARGED INTO THE LAKE WITHOUT ENDANGERING THE PURITY OF THE WATER IN THE HARBOR OR THE PURITY OF THE WATER AT THE LAKE INTAKE. Here the general drift is eastward, but the effect of the wind over-balances this general movement. When there is no wind, the down stream lake current easterly is between one-sixth and one-half a mile a day which would take the sewage away from the bay and Presque Isle; but wave action and the vertical currents induced by winds and temperature changes could combine possibly to take the sewage to the lake intake.

"It should be remembered. that even now the discharge of the sewage of the city at any one point into the lake would create a floating sewage field discernible to the eyes over an extended area and that as the city grew this area would increase and so would the possibility of some part of it reaching the city's water supply. Constant pollution of the drinking water would not result but the circumstantial pollution might be sufficient to produce a fatal catastrophe. Any change in the existing sewerage system and method of disposal should safeguard the city against these dangers."

c—Decree of 1909.

The Department's report on the proposed sewerage plan was incorporated in a decree to the city of Erie dated April 13, 1909, and under General Conditions and City Water Works, the following was stated in the report:

"The city of Erie, estimated population 67,000 is a substantial and progressive community, the county seat of Erie county. located along the shores of Lake Erie and possessed of the only natural harbor of any extent on this body of water between Buffalo and Sandusky.

"This harbor, known as Presque Isle Bay, is about 4.5 miles long and 1.5 miles wide. It is formed by a peninsula named Presque Isle, which nearly land locks the bay. The harbor inlet is a channel 340 feet wide and 20 feet deep, confined between two breakwaters which are distant from the main shore nearly a mile and opposite the eastern portion of the city. The bay and Presque Isle extend westerly, the latter bowing out crescent shape from the northern break water about a mile and a half into the lake and thence sweeping around to the south west joins the main land 4.5 miles west of the inlet. The southerly breakwater turns at right angles and extends towards shore for a quarter of a mile, terminating at a projection of the main land now occupied by the Pennsylvania Soldiers' and Sailors' Home. The property contains 111 acres. The main buildings are located on high ground in the city just above the flats.

"The municipal territory abuts on the bay for about two miles westerly from the inlet and along the lake one mile easterly and it extends back therefrom about two and a quarter miles.

"Along the shore of the lake and the bay there is a bluff about 50 feet high and back from it the land rises gradually to an elevation at the southerly city line of approximately 100 feet higher. Southerly in the township of Mill Creek "the land continues to rise, reaching an elevation at the summit three miles beyond the city of 550 feet above the lake.

"The general surface of the region in an easterly and westerly direction is that of a uniform plain sloping to the shore interspersed by deep gullies where there are streams. There are five such streams within the city limits, two of which, Lighthouse Run and Garrison Run rise in or near the city and empty into the lake; the other three empty into the bay. The most important one of these three streams is Mill Creek. It heads about ten miles southeast of the city in Green Township, enters the city about due south of the inlet and thence flows directly north into the harbor. The watershed comprises about seventeen square miles. Little Cascade Run rises in the city limits and flows northerly into the Bay in the western part of Erie. Cascade Creek rises in Mill Creek township and empties into the bay at the western boundary of the city, its drainage area being almost wholly within Mill Creek township, or that part of said township west of the city.

"The total drainage area tributary to the bay, is about twenty-six miles.

"Early in the history of the State the General Assembly reserved for the use of the Commonwealth the island or peninsula of Presque Isle, all of the harbor formed by it and the main land, and a tract of said main land extending eight miles along the shore of said lake and bay and three miles in breadth. Later to promote the progress of settlements within the Commonwealth and to afford additional security to the frontiers thereof, a law was passed for the laying out and establishment of a town, now the city of Erie. This law also provided for the setting apart of certain tracts on the south side of the harbor at the entrance and on the peninsula near the harbor entrance for the accommodation and use of the United States in erecting and maintaining forts, dock yards and other improvements.

"In 1903, the Commonwealth of Pennsylvania provided for the conveyance of 175 acres of land located on Presque Isle to the Commissioners of Water Works in the city of Erie, to be used exclusively for purposes incident to supplying said city with water.

As further evidence of the peculiar rights which the State has reserved and is exercising for the security of its inhabitants and for the general weal, it may be noted that the Legislature of 1907 appropriated $150,000 for the improvement of the port of Erie by the construction of a modern steam boat landing or wharf upon State lands lying at the foot of State Street.

"Also that in 1903, the Commonwealth of Pennsylvania provided for the conveyance of 175 acres of land located on Presque Isle to the Commissioners of Water Works in the city of Erie, to be used exclusively for purposes incident to supplying said city with water.

"The water works system comprises an intake crib in the lake and two in the bay, a pumping station, a storage reservoir and a distributing system.

"The older of the two intakes in the bay is a four foot pipe 975 feet long, terminating in a crib opposite the pumping station at the foot of Chestnut Street. It has been damaged and is not used, except, possibly, in emergencies, because of sewage pollution of the waters there.

"This old intake was constructed in 1868. The second bay intake was completed in 1896. It is a sixty inch steel pipe 8,307 feet long buried at least three feet deep in the bed of the bay and terminating at the outer end in an octagonal crib forty feet in extreme width and eight feet high, the top being thirteen feet below the bay level. The superstructure is made of steel circular in shape provided with a landing and inside there is an operating platform for valves and necessary conveniences for the maintenance of lights. The location of this superstructure and intake is about three quarters of the distance across the harbor. Two winters ago the ice damaged the building and demolished it, so it is reported.

"The present intake is an extension of the sixty inch steel pipe across Presque Isle out in the lake one mile from the north shore of the Isle. The right to extend the intake pipe under the bay and thence across the land belonging to the United States on the peninsula to the shore of Lake Erie and as far as necessary out into said lake to secure pure water, together with the right to the use of such land on the peninsula necessary to install settling basins and filter beds, was granted to the Commissioners of Water Works by an Act of Congress in 1893. The settling basins and filters are now being constructed. It is the purpose to maintain the old intake on the sixty inch pipe in the bay for emergency uses.

"The pumping station houses three steam engines. One raises water into the distributing pipe in the higher districts of the city, from which there is an overflow arrangement to the reservoir; the others raise the water into the lower district of the city and thence into the reservoir.

"There are one hundred and twenty-five miles of street mains whose diameters vary from four to thirty inches. At the pumping station there is a steel standpipe five feet in diameter and two hundred and fifty-nine feet high originally. It has been abandoned and all except about sixty feet taken down.

"The storage reservoir on the hill, constructed in 1873 holds when full 32,950,000 gallons, the average depth of the water then being 26.5 feet and the surface 237 feet above the harbor level. The structure is an earth embankment five hundred and forty-five feet long by 422 feet wide, interior dimensions, the bottom and sides are laid in brick cemented and there is a center wall. The reservoir is distant back on the hillsides about two miles from the pumping station.

"The daily consumption for all purposes is reported to be a little less than twelve million gallons. About everybody depends upon and uses the public supply. Three quarters of the total amount used is for domestic consumption, so it will appear that there is an abnormal use of water in the city.

Some indication of the impurity of the supply, while the water is being drawn from the harbor, is afforded by a study of the local typhoid fever records. The death rate decreased after the extension of the intake far out in the bay. Following this, however, there was a gradual increase and there was a marked increase in the last four years. For January 1908, sixty-nine cases were reported, and for February forty-four cases, making a total of 113 cases in two months, equal to the yearly total for 1905. The average death rate per 100,000 population for the 32 year period from 1876 was 37, the maximum being 73 and the minimum 14. The maximum ought not to be more than the minimum has been. Suspicion has been directed to the water supply as the medium of transmission of infection. Bacteriological tests have been made of samples of water from the lake and from the intake pump well and reservoir, for a number of years, by experts in the employ of the city. These tests have shown sewage pollution in the reservoir water. Also that sewage organisms were always present in the raw water of the bay. It is to be hoped that the new lake intake and settling basins will prove adequate to furnish the city with a pure and abundant supply of water and that no necessity will arise for the use of the harbor intake.

"The sewer system of Erie City was originally constructed on the combined plan. In recent years the extensions have been largely on the separate system, the pipes ranging from nine to twelve inches in diameter. About all of the city is sewered and approximately ninety-five per cent of buildings on streets where sewers are laid have sewer connections.

"There are eleven sewer outlets into the harbor and three into Lake Erie east of the harbor, making a total of fourteen city sewer outlets, counting Cascade Creek, Little Cascade Run, Mill Creek, Garrison Run and Lighthouse Run, each as a sewer outlet. The system comprises a total of 79.86 miles, there being 68.94 miles of sewers discharging into the harbor and the remainder discharging into the lake. The following table shows these outlets and the length of tributary sewers beginning at the west end of the city and named in order easterly.

1.	Cascade Creek,	2.10 miles
2.	Plum Street,	0.16 miles
3.	Little Cascade Run,	14.40 miles
4.	Mytrle Street,	0.15 miles
5.	Canal Street,	7.40 miles
6.	Peach Street,	0.37 miles
7.	State Street,	0.21 miles
8.	French Street,	0.74 miles
9.	Between Holland and French Streets,	0.20 miles
10.	Holland Street,	0.61 miles
11.	Mill Creek,	42.60 miles
12.	Wayne Street,	3.70 miles
13.	East Avenue,	0.72 miles
14.	Lighthouse Run,	6.50 miles

"No 12 outlet is otherwise known as Garrison Run. It and the last two discharge into the lake. The other eleven empty into the bay.

"The Cascade sewer outlet, 18 inches in diameter empties into the creek at Cranberry and Fourth streets at the westerly city line. About one mile of the tributary sewers are in the township. Down this creek valley extend railroad tracks to three large railroad docks. The creek empties at the westerly dock. This structure is earth filled and extends out into the harbor 1,200 feet. It forms the bulkhead which tends to hasten subsidence of suspended matters brought into the harbor by the creek. The prevailing westerly winds have full sweep here and the wave of action stirs up the deposits. There is always some creek flow which during showers is accelerated to torrents that rush down the steep gorge, scouring out the sediment at the mouth and along the dock carrying it beyond the end of the dock into the harbor.

"At the mouth of Little Cascade Run which discharges into the harbor at the foot of Cherry Street from a quite thoroughly built up residential district in the city are the ice houses of the Mutual Ice Company. The crop is harvested from the harbor opposite the run and about a quarter of a mile distant from the shore. Two blocks easterly is Chestnut Street opposite the end of which is the original crib and intake distant about 1,600 feet from the mouth of Little Cascade Run. This intake was used during an emergency in the early part of the year 1908, so it is reported. Whether the alarming increase in typhoid fever which followed may be justly attributed to such use is a question about which there might not be much discussion. However, it is positively certain that the waters would be unsafe even if there were no sewage put into the harbor except that from the district first mentioned sewering into Cascade Creek. This distance from the end of the westerly railroad dock is about four-fifths of a mile. The sewage from Cascade Creek could under favorable circumstances poison the water where the ice is now harvested and where the old water works intake is now located and within a few hours from the time such poison were emptied into Cascade Creek it might be transmitted to the intake and thence be introduced into the dwellings of water consumers in the city. Even the use of the ice so harvested would be dangerous, but when it is considered that the sewage of thousands of people is emptied into the harbor within a few hundred feet of the ice supply and the old intake, the conclusion is that the use of either for domestic purposes must be attended with positive peril and should be absolutely prohibited.

"The swimming pool built by the water board on land reclaimed at the foot of Chestnut street opposite the pumping station, is a concrete lined basin seventy-five feet wide and 155 feet long. It is understood that the water in this pool is furnished from the water works system. The raw water along the shore of the city is not popularly considered suitable in which to bathe.

"The canal basin is at the foot of State Street on either side. It was built by the Commonwealth from proceeds of the sale of water lots directed by the Assembly to be devoted to harbor improvements The State canal from Erie over the summit to the Shenango and Beaver Rivers was a separate undertaking, so it is reported, and when finally abandoned was owned by the Pittsburgh and Erie Railroad, which corporation conveyed the land to the abutting property owners. The canal sewer is a four foot brick structure, built in the former canal bed from Front street to Ninth street, a distance of 4,200 feet. It serves a well built up district, residential, in which the sewer system all told comprises 7.4 miles, of which nearly six miles are pipes fifteen inches or less in diameter.

"The four foot outlet terminated in an unfilled portion of the canal bed in Front Street. There is an open ditch through the bed and two twenty-four inch pipes under the filled part of Front Street and thence an open ditch northerly to the canal basin, or that portion west of State Street. When the two twenty-four inch pipes are insufficient in capacity to deliver the flow from the forty-eight inch canal sewer, then a pool of sewage forms in the hollow and becomes a great nuisance. However, ordinarily the sewage odors from the open ditch are offensive and have been the subject of much complaint. The western canal basin is about 750 feet long by 275 feet wide and the eastern one is slightly larger. They are both surrounded by docks, except at the entrances. The modern steam-boat landing authorized by the Legislature has been erected northward from the canal basin to the harbor line in the extension of State Street. The waters of the west basin are especially filthy. Sedimentation is effectively promoted here and it is not debatable that an enlightened self-interest should terminate the use of this place for the depositing of the city's filth to the menace of public health, and the ultimate impairment of navigation.

"Outlet No. 6 is an eighteen inch pipe into the west basin at the foot of Peach Street.

"Outlets Nos. 7, 8, 9, and 10 are all into the east basin at the foot of State, French, between Holland and French, and Holland Streets, respectively; comprising all told 1.76 miles of sewer. The entrance to the eastern basin is about 3-5 of a mile distant from the old water works intake. Without doubt the polluted liquids from either basin materially add to the contamination of the water in the harbor, although a minimum amount of sewage sediment may escape from them into the bay. Fish houses are located all along the docks in this part of the town and there are many ways by which the infection in the water may be transmitted to the human system.

"Mill Creek discharges on the shores at the extreme eastern end of the harbor in a cove formed on the west by railroad docks and on the east by the grounds of the Soldiers' and Sailors' Home.

"At its mouth there is an extended accumulation of earth deposit and sewage sludge brought down from the city and the outside country. The shores here were formerly sandy, now they are miry and the water in the cove is becoming shallower. More complaint is occasioned by the foul condition in this cove than by any other existing nuisance along the entire harbor front. The State Institution grounds have been ornamented and parked. People who resort here are subjected to offensive odors from the cove. The inmates of the State Institution, numbering about five hundred, are also subjected to the discomforts of the nuisance. The main buildings are about one quarter of a mile distant from the creek mouth. When the winds are from the right direction, strong sewage odors are perceptible at the home. Also at the dwellings along Second Street.

> "Second Street is at the head of the bluff. From here southerly up through the city the creek channel has an average depth of seventeen feet below the streets under which it passes through culverts and bridges of which there are twenty in highways, two at railroads.
>
> "The channel is generally in shale rock, has an average width of about thirty feet, in some places the sides are walled up, between Ninth and Tenth Streets buildings are erected over it, and on its banks all through the city there are numerous dwellings, business blocks and manufactories.
>
> "Except as above mentioned, the channel is open and in daily use as a repository for garbage, dry waste, rubbish of all kinds and domestic and manufactural sewage. Outside of the city limits the waters of the creek appear to be unpolluted and clear and such as customarily flow from wooded and agricultural drainage areas. But within the city limits the stream becomes an open sewer and is offensive. It appears that the city has been a defendant in numerous suits for damages to abutting property owners by reason of the pollution of Mill Creek. There are forty-three open public sewer outlets into it besides several private sewers."

Of the eighty miles of public sewers in the city, over fifty miles are of pipes 15 inches or less in diameter. The sewage from the Soldiers' and Sailors' Home is partly discharged into Garrison Run and partly into Mill Creek. The sewage from the dock and from the ships and from manufacturing plants along the shore goes into the harbor. Numerous cottages and club houses and a small settlement called Fern Cliff add to the pollution of the bay waters

The plans submitted to the State Department of Health for approval in 1909, called for two main intercepting sewers, one along Front Street from Mill Creek the entire length of the city westerly, and the other up the valley of Mill Creek the entire length of the city.

The design of the intercepting sewer system was not to prevent absolutely the discharge of sewage into the harbor but to reduce this discharge which is now continuous to short periods of a few hours at a few times only during the year. To effect a greater improvement than this would involve the reconstruction of most of the sewers of the city or the paralleling of them by storm drains. The decree went on to state:—

> "There are about fifty miles of paved streets in Erie. The expense of an absolute separation of the sewage from the storm water would be so much greater than the cost of the plan proposed, that the additional safety to public health secured by this excessive cost, in the opinion of the local authorities, would not be commensurate. As Erie is a Lake port, some sewage pollution from vessels in the harbor is bound to occur and the city's experts maintain that the sanitary condition effected by the proposed plan will amount practically to the entire removal of the menace to public health now existing in the harbor by reason of the discharge of sewage therein, and that for all future time these plans will prevent any material pollution of the waters of the State and safeguard public health to a reasonable degree.
>
> "After the plans for the treatment of the sewage have been decided upon and approved and the cost of treating each million gallons of sewage has been reliably estimated, the question of how much storm water it will pay the city to eliminate from the intercepting sewers by the construction of new storm drains can be determined.

"It is clearly apparent that the sewage must be intercepted and conveyed into the lake somewhere outside of the harbor; and that the sewage will require to be purified before the liquid portion be discharged into the lake. Furthermore, if no point can be found within a reasonable distance where crude sewage can be temporarily discharged into the lake without imminent danger of being carried back by tides into the harbor or around Presque Isle to the new water works intake, then the treatment of the sewage is an immediate necessity. Furthermore, the type of plant and the degree of purification necessary bears an important relation to the oxidizing and purifying actions naturally existing in the great volume of the lake waters and the problem demands to be studied in its entirety.

"It would be well to reflect that the condition would not be changed materially even were the water supply to be filtered. Filtered water plants break down, emergency intakes are customary and are usually required so that the installation of water filters would not obviate the necessity for stopping the sewage pollution of the harbor waters and this point is reiterated and emphasized.

"Owing to the State's peculiar holdings along the water front and on Presque Isle, as hereinbefore set forth and to the fact that the State Hospital sewage is independently discharged into the runs (which discharge must be discontinued) the State Department of Health can consistently exercise a greater concern in the preparation of plans for sewage treatment works than is its custom elsewhere. But the initiative work must be done by the city, and while the surveys, plans and details and actual work can well be done by the city engineer, it would be a wise thing for the municipality to provide this official with the services of a recognized expert on the treatment of sewage, to consult and advise relative to the investigations and studies and possible experiments which it may be found economical to institute.

d—Conclusions of the Decree of 1909.

"In view of the foregoing consideration, it has been unanimously agreed by the Governor, Attorney General and the Commissioner of Health that the interests of the public health will be subserved by approving the proposed street sewer improvements and the intercepting systems, and I do hereby and herein approve the same subject to the following conditions and stipulations.

"FIRST: The Front Street intercepter plan is approved including the 20-inch sewer from Little Cascade Creek westerly in preference to a 12-inch sewer here; but for the reasons hereinbefore given the precise elevations of this line of intercepting sewer shall be determined in relation to the sewage treatment plant in order, if possible to assume a gravity discharge of the sewage through said plant. And until the plans therefor shall have been prepared by the city and submitted to and approved by the Commissioner of Health, the city shall not build any part of the Front Street intercepter. .

"SECOND: The Mill Creek intercepter plan is approved; but for the reasons hereinbefore given the precise elevations of the lower portion of this line of intercepting sewer at least as far up-stream as to Fourth Street shall be determined in relation to the sewage disposal plant. And until the plans therefor shall have been prepared by the city and submitted to and approved by the Commissioner of Health the city shall not build that portion of the said Mill Creek intercepter but it may build any other part thereof since the sewage disposal question bears no relation whatsoever to the elevations of the grades of the intercepting sewer in Mill Creek above Fourth Street.

"THIRD: On or before July first, 1909, the city shall submit a carefully devised tentative plan for the treatment of the municipal sewage to the Commissioner of Health for approval. As modified, amended or approved, the plans shall be worked out in detail and be finally submitted to the State Department of Health on or before the first day of January 1910. This plan shall be accompanied by a satisfactory report. The said tentative plan having been approved the elevations of the Front Street intercepter and of the lower Mill Creek intercepter will be determined and final approval issued by the State Department of Health relative to these two intercepting sewers.

"FOURTH: On or before January 1st, 1910, the city shall submit to the Commissioner of Health for approval detail plans for the interception of the sewage discharging into the lake.

"FIFTH: Approval of the lateral street sewers is given under the condition that storm and roof water shall be excluded therefrom and that at the close of each season's work plans of the sewers laid during the year shall be filed in the office of the State Department of Health, together with any other information in connection therewith that may be required, to the end that the Commissioner of Health may always be informed of the extent of the sewer system and the public use thereof.

"SIXTH: No pathogenic material from any laboratory shall be discharged into the sewer system. The proper authorities shall cause these wastes to be destroyed on the premises.

"SEVENTH: In the study of the sewage treatment problem, the city shall give due consideration to the suggestions hereinbefore given relative to the elimination to the greatest practicable degree of storm water from the existing sewer system and submit a plan and report therefor, with the other plans for sewage treatment to the Commissioner of Health for approval on or before January 1st, 1910. This condition is made a special stipulation.

"EIGHTH: It is fourthermore stipulated that the object of this decree is to bring about at the earliest practicable moment the construction of the intercepting sewer system in its entirety, to the end that the interests of the public health shall be subserved, and that sewage shall cease to be discharged into the waters of the State. The Governor, the Attorney General and the Commissioner of Health will upon submission of the plans called for the treatment of the city sewage fix a time within which the intercepting sewer system shall be completed."

e—Decree of 1910.

On December 19, 1910, the city submitted for approval plans and report for disposal of the sewage of the city, the object of the improvements being to accomplish by degrees the elimination of the nuisances and menaces now existing in Mill Creek and along the shores of the harbor. The following are excerpts from the Department's report:

"The Mill Creek intercepter is completed from Fourth Street to Twenty-second Street. The entire line will be finished during the next season and the numerous sewer outlets into Mill Creek will be connected to the intercepter and the sewage will then be deposited in Mill Creek at the proposed junction of the Mill Creek intercepter and the Front Street incepter until such time as the sewage treatment works are built and put in operation. The city asks approval of the plan and grade of the sewer from Fourth Street to said junction and also for approval of the grade of the intercepter proposed along Front Street. The elevation of the invert at the junction of these two main intercepters is twelve feet, city datum. Withholdment of approval of this elevation was decreed until it should be definitely determined whether this grade was best adaptable to the sewage works. It now appears from the plans offered that it is feasible with the vertical head room available 13.3 feet between the invert at the junction of the said intercepters and the mean lake level to install sewage works to admit of the treatment of the sewage and its disposal into the lake by gravity.

"The disposal of the raw sewage into Mill Creek at the junction manhole will create at this point a much greater nuisance than the one now there. It ought not to be suffered to exist except temporarily and until sufficient time has elapsed for the city to determine upon the best plan for the permanent disposal of the sewage and to erect such works. The money to pay for the building of the Front Street intercepting sewer has not been provided by the local authorities. It will be a matter of at least two seasons before this long intercepter can be built and put into commission. There is no reason, now that the grades have been permanently agreed upon, why this sewer should not be built immediately.

"The object of the grit chambers is to intercept the larger floating matters and to collect the sand and gravel which sift into the sewers through manhole covers or otherwise and if not collected will find their way into the sludge collecting wells and interfere with the proper operation of the wells. The plans call for grit chambers roofed over to afford protection for the operators and to confine the gases of fresh sewage.

"The sedimentation basins proposed are of the Emscher tank type. They are to be open on top but if found desirable, they can be roofed over at any time at moderate expense. The weir level that will maintain the water level in the tanks is to be equal to the invert of the junction manhole. The 54 inch pressure sewer outlet will start with an invert elevation of zero and be laid on a descending grade to its outlet at the bottom of the lake in 26 feet of water, 3,800 feet off shore and 4,500 feet off the entrance to the harbor. This point is 1,600 feet nearer the shore than the sailing course leading to the entrance of the channel. The observations conducted by the city engineer in pleasant weather show that the currents at this point are in all directions, depending entirely upon the strength and direction of the wind. The surface and lower currents travel together when the wind is from the west; otherwise they move in opposite directions. It has been concluded that no more favorable point for the discharge of clarified sewage can be found within a reasonable distance of the sewer in the lake than the point selected. The city water works intake is five miles distant and on the opposite side of the Peninsula.

"The proposed disposal of the digested sludge is looked upon with some apprehension. It is problematical to what extent bacterial activity will destroy the organic matter in the sludge. No experiments have been conducted at Erie to determine this question for Erie sewage. If the process were impeded for some unknown reason, there would likely be a nuisance accompanying the proposed drying out of the sludge. The site selected for the sewage works is not over one thousand feet from dwellings. It is in a section of the city devoted to manufactural pursuits, and adjacent to land which in the future will be used for dockage purposes. The only other available site for sewage works is on Presque Isle and the cost of the works to convey the sewage to this point would be greater than the entire cost of the disposal works proposed. It is feasible to dry out the sludge taken from the digester in mechanical dryers and to dispose of this matter by combustion. The local authorities are now considering the destruction of the city garbage by cremation. The practicability of erecting the crematory on the land bought by the city for the sewage works should be considered in connection with its possible utility as an adjunct to the sewage disposal works. The method of sludge disposal shall be given further consideration. The Emscher tank process has been tried out in practice in Europe sufficiently to have established it as worthy of careful consideration. However, the degree to which Erie sewage may be treated with success by this process is problematical. The cost of erecting a small experiment station and of conducting practical tests of the process at Erie would be small and the observations made by the experiment would be of great benefit to the city. Practical results should accrue that would make the design or the application of the design of the tank to Erie's needs one of certainty. The State Department of Health does not wish to discount the merits of the plan now proposed, but it believes that the city should go somewhat further with the study of its disposal problem before deciding definitely and finally on definite details for the construction of the works. The season of 1911 should be ample in which to work out the problem, during which the construction of the Front Street intercepter should be undertaken.

f—Conclusions of the Decree of 1910.

"It was unanimously agreed by the Governor, Attorney General and the Commissioner of Health that the interests of the public health would be subserved by approving the proposed plans for the treatment of the city sewage subject to the following conditions and stipulations:

"FIRST: The city shall proceed during the season of 1911 to construct and put into operation the Front Street intercepter in conformity with the plans approved.

"SECOND: The city shall, during the season of 1911, institute and conduct a series of experiments with the type of sedimentation and digesting sludge tanks and final method of disposing of the sludge and at the close of the year submit a detailed report of the tests with any modifications they may suggest in the plans now offered for consideration to the Commissioner of Health for approval.

"THIRD: The plans to be finally considered shall provide for the disposal of all of the sewage of the city at one point in the lake after such treatment as shall be decided upon. There shall be no by-passes or discharge of raw or treated sewage at any place except this one place and according to the method to be finally agreed upon.

"FOURTH: This permit is issued subject to the relevant conditions of the said permit of April 13th, 1909."

The date of this decree was December 29th, 1910.

PART II. TYPHOID FEVER AT ERIE, PAST AND PRESENT.

1. For Harbor Water, Original Intake, First Supply Period.

In the following table the record of typhoid fever deaths in Erie for 21 years prior to the installation and use of the new intake crib at Big Bend at the north side of the harbor opposite the pumping station and 8,200 feet distant, is given. The cases were not reported for these early years. The deaths represent the prevalence of the disease. During this 21 year interval, raw water, taken from the harbor 1,000 feet from shore, was supplied to the consumers. This water was polluted with sewage.

The early records of the City Board of Health for deaths by years are not consistent. In the following table the largest number of deaths reported in any year is used for that year.

TYPHOID AND OTHER DATA WHILE THE CITY WAS SUPPLIED WITH WATER FROM HARBOR FRONT INTAKE.

Year.	City reports. Typhoid deaths.	City population.	Typhoid death rate per 100,000 population.	Water pumped in mil. gals. daily.	Population supplied.	No. of places supplied.	Miles of pipe in system.
1876,	14	24,500	56	1.80	10,000	2,463	18
1877,	10	25,300	40	1.87	11,100	....	22
1878,	6	26,100	23	1.94	12,200	....	26
1879,	8	26,900	30	2.02	13,300	....	30
1880,	6	27,754	22	2.10	14,400	3,568	34
1881,	17	29,000	58	2.28	16,000	....	39
1882,	21	30,200	69	2.46	17,700	....	43
1883,	8	31,500	35	2.64	19,400	....	47
1884,	10	32,800	30	2.82	21,100	....	51
1885,	15	34,100	44	3.00	22,800	5,658	55
1886,	12	35,400	34	3.30	24,400	....	58
1887,	10	36,700	27	3.60	26,100	....	61
1888,	9	38,000	23	3.90	28,000	....	64
1889,	19	39,300	46	4.20	29,700	....	67
1890,	29	40,638	70	4.50	31,200	7,728	70
1891,	30	41,800	72	4.66	33,000	....	74
1892,	24	43,000	55	4.82	35,000	....	78
1893,	15	44,300	35	4.98	37,000	....	82
1894,	17	45,500	37	5.14	39,000	....	86
1895,	21	46,700	44	5.30	41,000	....	90
1896,	19	47,900	38	5.50	44,000	10,846	94

Average typhoid death rate,	42
Maximum typhoid death rate,	72
Minimum typhoid death rate,	22

During this first period there seems to have been but a slight increase in typhoid deaths. To be sure the high rate of 1882 was not quite as high as the other high period in 1890-91; but the low rates of 1878-9 were substantially the same as the low rate for 1888. The average for the entire 21 years was 42 deaths per 100.000 of population.

2. For Harbor Water, Big Bend Intake, Second Supply Period.

In the table II is given the typhoid fever deaths reported by months for each year from 1897 to 1911, inclusive. The table following it gives the cases reported by months for the same period.

TABLE II.—TYPHOID FEVER DEATHS REPORTED BY CITY.

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Totals. Deaths.	Totals. Cases.
1897,	2	1	0	1	0	0	0	0	1	4	1	2	12	38
1898,	1	0	2	1	0	0	0	0	2	0	0	1	7	73
1899,	1	1	1	1	5	1	2	1	2	1	1	1	18	65
1900,	3	0	1	1	0	2	2	2	2	1	0	4	18	124
1901,	3	0	0	2	1	0	0	0	0	0	0	2	8	80
1902,	4	1	1	1	2	0	1	0	1	1	1	0	13	189
1903,	2	1	2	0	3	2	2	0	0	0	0	5	17	157
1904,	1	2	5	4	5	3	2	0	2	2	0	1	27	226
1905,	2	0	1	2	0	0	0	0	2	1	0	3	11	113
1906,	9	3	0	1	2	1	1	4	2	3	3	0	29	146
1907,	4	11	2	4	6	2	1	3	4	5	4	3	49	316
1908,	7	6	6	4	4	1	2	1	3	3	1	1	39	281
1909,	1	1	1	0	1	1	1	2	1	6	2	2	19	158
1910,	1	2	3	7	1	3	0	0	3	2	2	2	26	220
1911,	24	56	22	14	8	0	1	3	3	1	2	1	135	1,067

TABLE III.—TYPHOID FEVER CASES REPORTED BY CITY.

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Totals. Cases.	Totals. Deaths.
1897,	4	1	1	3	1	2	1	4	3	4	5	9	38	12
1898,	11	14	6	6	1	1	4	5	13	2	5	6	73	7
1899,	6	9	5	14	5	6	2	5	3	5	2	3	65	18
1900,	28	4	10	10	7	6	2	7	16	11	4	19	124	18
1901,	16	4	5	7	4	1	5	2	3	2	3	28	80	8
1902,	59	46	17	8	6	3	6	10	10	8	4	12	189	13
1903,	33	7	13	7	7	9	9	11	8	9	17	27	157	17
1904,	18	39	33	41	27	20	15	2	15	4	2	12	226	27
1905,	3	6	5	9	2	4	4	4	18	16	20	22	113	11
1906,	30	20	25	10	14	5	6	3	5	10	10	8	146	29
1907,	29	66	19	44	43	12	15	9	28	18	10	23	316	49
1908,	69	44	23	20	14	15	10	8	22	27	12	17	281	39
1909,	15	11	7	2	7	4	8	15	42	25	7	15	158	19
1910,	5	17	48	7	9	3	3	18	38	26	15	31	220	26
1911,	239	521	172	57	17	6	11	7	13	11	5	8	1,067	135

During this second period (the years 1897 to 1908 inclusive) the public in Erie was supplied with harbor water taken from the Big Bend intake 8,000 feet distant from the sewer outlets. Still the water was subject to pollution and while there was a dropping off in the typhoid death rate for a few years in spite of the growth of the city and additional quantities of pollution emptied into the harbor, the rate gradually increased until the maximum was greater than the maximum for the first period when the water was drawn from the original intake 1,000 feet distant from the sewers.

During the second period (comprising 12 years) the average typhoid death rate was 35, the maximum 78 and the minimum 14, as shown by table IV.

TABLE IV.—TYPHOID AND OTHER DATA WHILE THE CITY WAS SUPPLIED WITH HARBOR WATER FROM BIG BEND INTAKE.

Year.	City reports. Typhoid deaths.	City population.	Typhoid death rate per 100,000 population.	Water pumped in mil. gals. daily.	Population supplied.	No. of places supplied.	Miles of pipe in system.	Typhoid cases reported.
1897, ...	12	49,100	24	6.0	47,000	11,385	96	38
1898, ...	7	50,300	14	6.8	48,000	....	98	73
1899, ...	18	51,500	34	7.6	49,000	....	101	65
1900, ...	18	52,733	34	8.5	50,000	12,451	103	124
1901, ...	8	54,100	15	8.7	51,600	....	106	80
1902, ...	13	55,500	23	8.3	53,200	....	109	189
1903, ...	17	56,900	31	9.8	54,800	....	113	157
1904, ...	27	58,200	46	10.1	56,400	....	116	226
1905, ...	11	59,600	19	10.5	58,000	13,778	119	113
1906, ...	29	61,000	46	11.3	59,600	....	122	146
1907, ...	49	62,400	78	11.8	61,300	....	124	316
1908, ...	39	63,800	62	12.2	63,000	16,761	127	281

Average typhoid death rate, ...	35
Maximum typhoid death rate, ...	78
Minimum typhoid death rate, ...	14

3. For Lake Water, Permanent Intake, Third Supply Period.

Table V shows the typhoid death rate for the third period during which the people were supplied with raw lake water, namely from 1908 to the present time.

TABLE V.—TYPHOID AND OTHER DATA DURING THE PERIOD THAT THE CITY HAS BEEN SUPPLIED WITH LAKE ERIE WATER.

Year.	City reports. Deaths.	City population.	Typhoid death rate per 100,000 population.	Water pumped, million gallons.	Population supplied.	Miles of pipe in system.	Typhoid cases reported.
1909, ...	19	65,100	29	12.8	65,000	130	158
1910, ...	26	66,525	39	13.8	66,500	133	220
1911, ...	135	68,000	198	14.6	68,000	139	1,067

Summarizing it will be noted that the rate was 42 while the original intake was in use. Then the rate dropped to 35 while Big Bend water was furnished to the city; but the rate declined one point only, on an average for the first two years that raw lake water has been furnished to the city, as shown in table VI.

TABLE VI.

	Period.	Average typhoid death rate.
1st.	1876 to 1896 Harbor water. Shore intake,	42
2nd.	1897 to 1908 Harbor water. Big Bend intake	35
3rd.	1909 to 1910 Lake Erie water,	34

4. Comparative Typhoid Death Rates for Erie and Other Places.

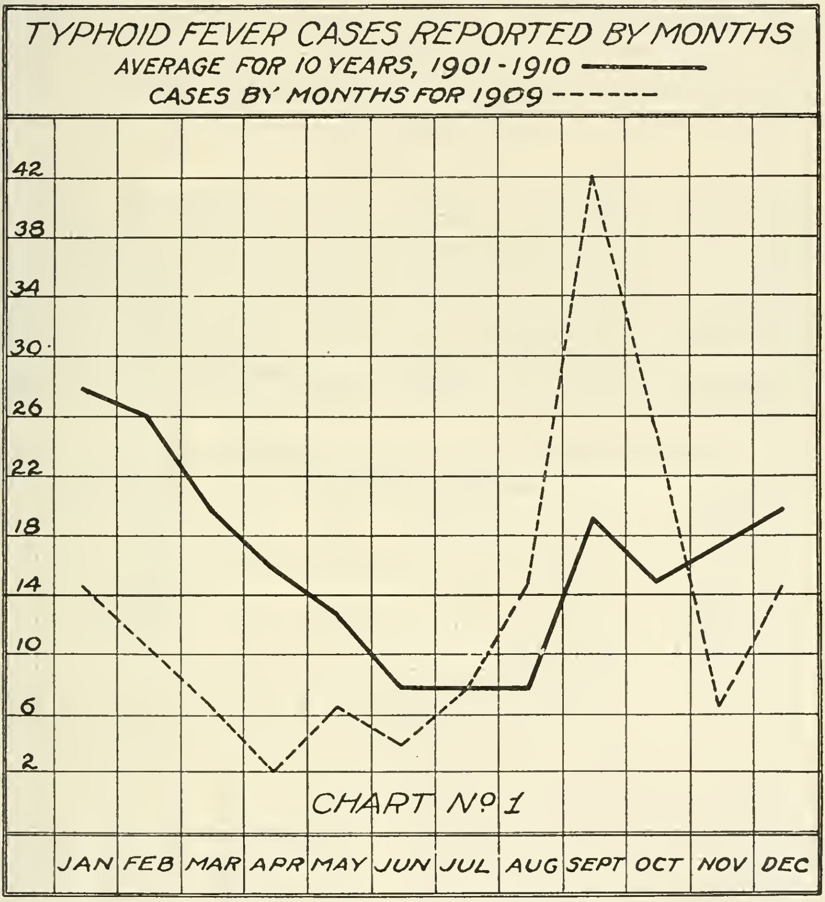
For the last five years the rate in Erie has been 51. Sixteen out of 20 places in Pennsylvania chosen at random show a lower rate than this and 8 places in other states. The data are given in the following statement.

TABLE VII.—SIXTEEN PLACES IN PENNSYLVANIA HAVING LOWER TYPHOID DEATH RATE PER 100,000 THAN ERIE AND RATES FOR OTHER TOWNS. CENSUS OF 1910.

Municipality.	Period.	Population.	Death rate for 5 years.
Scranton, Pa.,	1906-1910	129,867	36.1
Reading, Pa.,	1906-1910	96,071	42.5
Wilkes-Barre, Pa.,	1906-1910	67,105	29.9
Erie, Pa.,	1906–1910	66,525	50.8
Harrisburg, Pa.,	1906-1910	64,186	44.8
Johnstown, Pa.,	1906-1910	55,482	62.5
Altoona, Pa.,	1906-1910	52,187	51.0
Allentown, Pa.,	1906-1910	51,913	40.7
Lancaster, Pa.,	1906-1910	47,227	31.1
York, Pa.,	1906-1910	44,750	17.5
McKeesport, Pa.,	1906-1907	42,694	93.3
Chester, Pa.,	1906–1907	38,537	38.4
New Castle, Pa.,	1906-1907	36,280	60.8
Williamsport, Pa.,	1906-1907	31,860	46.1
Easton, Pa.,	1906-1907	28,523	32.5
Shenandoah, Pa.,	1906-1907	25,774	6.5
Hazleton, Pa.,	1906-1907	25,452	21.9
Lebanon, Pa.,	1906-1907	19,240	27.3
Mt. Carmel, Pa.,	1906-1907	17,532	6.1
Bradford, Pa.,	1906-1907	14,544	19.1
Meadville, Pa.,	1906-1907	12,780	33.7
Waterbury, Conn.,	1904-1908	73,141	23.9
Holyoke, Mass.,	1904-1908	57,730	8.2
Somerville, Mass.,	1904-1908	75,964	14.7
Manchester, N. H.,	1904-1908	70,063	19.4
Hoboken, N. J.,	1904-1908	70,324	17.7
Bayonne, N. J.,	1904–1908	55,545	13.9
Schenectady, N. Y.,	1904-1908	72,826	14.7
Utica, N. Y.,	1904-1908	74,419	19.6

The peristent prevalence of typhoid fever in the winter season for a number of years is usually indicative of water borne infection. Where with consistent regularity typhoid for the months of December, January, February and March exceed those of August and September and October—the latter being the season when conditions exclusive of water are most favorable for typhoid—careful attention to the water supply may be expected to materially reduce the winter onsets.

In the following chart, No. 1, the averages of the cases reported for ten years are plotted and also the cases by months for the year 1909 which more nearly represent the incident of typhoid where the quality of the water supply is unquestioned. Comparisons of these two curves indicate that Erie typhoid is of water borne origin to a considerable degree for the preponderance of the disease occurs in the winter time. There are good reasons to believe that not all of the cases have been reported to the City Board of Health, but the information at hand is sufficient for general deductions.



5. Temporary Decline of Typhoid when Lake Water was first used.

From September 16th, 1908, up to the present time, the citizens of Erie have been supplied with raw water taken from the lake at the new intake one mile off the shore of Presque Isle. This intake was selected with great care after the water commissioners had experimented with floats and tested the water numerous times from a bacterial standpoint. For the first 12 months following the introduction of lake water into the city there were 14 typhoid deaths only as compared to 45 deaths for the last 12 months' supply to harbor water, a diminution of 69 per cent. in typhoid deaths. Furthermore, all through the year 1909, the typhoid incident in Erie was known as compared to that of towns having a pure and wholesome water supply. This apparently justified the introduction of lake water. It was thought that the prevailing lake current would carry the sewage polluted water from the harbor entrance eastward away from the lake intake. There was during 1909, no event which showed how insecure was the protection afforded by the unstable lake currents. Up to this time the water commissioners possessed no information that was suggestive of the possibility of sewage pollution of the lake water supply.

For the second 12 month period of lake water use, there were 28 typhoid deaths as compared to the second 12 month period backward of harbor water use when there were 43 deaths. The winter of 1909-10 witnessed a typhoid increase which is suspected of having been water borne. In the adjoined chart, No. 2, the comparison of typhoid deaths for the two 24 month periods forward and backward from September 16th, 1908, is shown:

In January of 1908, while the Big Bend intake was in use there was a harbor ice movement which carried the superstructure—a steel cylindrical tower—off the crib intake, injuring it to such extent as to require repairs. So on January 15th of that year, the old sluice gate a t the original harbor intake was opened and used for 24 hours or more. It is reported that this valve has never been opened since. There was no marked corresponding rise in typhoid fever following the introduction of raw water through the old intake so far as the records show.

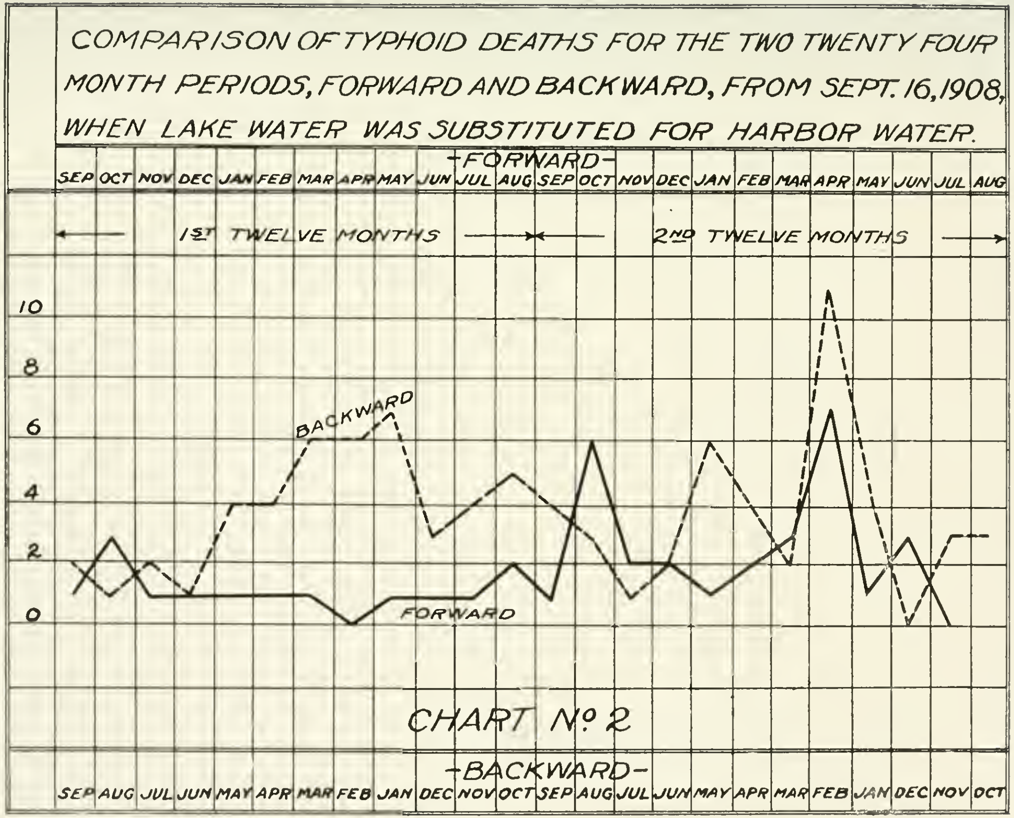
6—The 1910 1911 Outbreak.

a.—In General.

The outbreak of 1910-11 was thoroughly canvassed by officers of the engineering division. Mr. Ennis supervised this part of the work. As in times past, the doctors failed to report their cases. The names of the patients reported by the physicians at the office of the City Board of Health were at once investigated by the Department. Many unreported cases were picked up in the field and the names given to the city health officer. In the following tables, VIII, IX and X, is given the number of cases of typhoid fever reported to the City Board of Health daily for nine months, September 1910 to May 1911 inclusive, and a corrected list of cases, free from duplicates, occurring in the city and the county, chargeable to the epidemic. The total for the city was 1,036 cases and 126 deaths and for the county 42 cases and 5 deaths, making the grand total due to the epidemic, December to June inclusive, 1,078 cases and 131 deaths:

TABLE VIII.—TYPHOID FEVER CASES REPORTED DAILY TO CITY BOARD OF HEALTH.

Day.	1910.				1911.					Total.
	September.	October.	November.	December.	January.	February.	March.	April.	May.	
1,	1	2	......	1	3	13	23	2	......	......
2,	......	......	1	1	3	17	9	1	2	......
3,	2	1	1	0	1	21	9	1	1	......
4,	......	......	......	1	0	25	2	4	......	......
5,	2	......	......	0	9	11	5	2	......	......
6,	......	......	......	1	3	26	15	9	2	......
7,	......	......	3	1	17	29	16	3	......	......
8,	......	......	......	0	1	18	10	3	......	......
9,	1	......	1	0	2	16	6	0	......	......
10,	1	4	......	0	7	29	6	2	1	......
11,	6	......	......	0	5	13	4	3	3	......
12,	......	1	......	1	14	7	4	1	......	......
13,	1	......	1	0	4	36	10	3	1	......
14,	2	......	1	0	9	24	3	2	......	......
15,	2	4	1	0	0	21	2	2	......	......
16,	......	1	......	3	7	27	8	0	2	......
17,	3	......	......	0	10	21	6	5	1	......
18,	2	2	2	0	2	14	2	1	......	......
19,	......	......	......	1	2	10	1	0	3	......
20,	6	3	......	2	12	20	3	0	......	......
21,	......	......	......	0	6	28	1	0	......	......
22,	4	......	......	1	2	15	4	5	......	......
23,	1	......	......	1	14	17	2	0	......	......
24,	......	1	2	1	13	10	4	1	......	......
25,	......	......	......	1	7	23	5	2	......	......
26,	2	3	......	3	9	6	1	1	1	......
27,	......	......	......	2	13	16	4	1	......	......
28,	1	2	......	1	9	7	2	4	......	......
29,	2	......	1	1	4	......	1	0	......	......
30,	......	1	1	1	25	......	0	0	......	......
31,	......	......	......	7	19	......	2	0	......	......
Cases,	39	25	15	31	232	520	170	58	17	......
Deaths,	3	2	2	2	24	56	22	14	8	......



COMPARISON OF TYPHOID DEATHS FOR THE TWO TWENTY FOUR MONTH PERIODS, FORWARD AND BACKWARD, FROM SEPT. 16, 1908, WHEN LAKE WATER WAS SUBSTITUTED FOR HARBOR WATER.

CHART No. 2

TABLE IX.—CORRECTED NUMBER OF CASES AND DEATHS, ERIE EPIDEMIC.

Month.	Cases.			Deaths.		
	City.	County.	Total.	City.	County.	Total.
December 1910,	31	7	38	2	0	2
January, 1911,	232	9	241	24	1	25
February,	520	21	541	56	3	59
March,	170	5	175	22	1	23
April,	58	0	58	14	0	14
May,	17	0	17	8	0	8
June,	8	0	8	0	0	0
	1036	42	1078	126	5	131

TABLE X.—CORRECT CASES AND DEATHS IN ERIE FOR THE YEAR 1911.

1911.	Cases.	Deaths.
July,	7	1
August,	7	3
September,	13	3
October,	11	1
November,	5	2
December,	8	1
Total,	51	11
For first six months,	1005	124
Total for year,	1056	135

b.—By Onsets.

On January 28th, 1911, the city reports showed 186 cases for the month and 31 cases for December, when in fact, if the physicians had reported, the records would have shown 313 cases for January and 91 for December, or a total of 404.

In the following table XI is given the actual onset of the cases. Some of the cases reported were found to have been duplicates. The Department began with the December patients and gathered data concerning each one through the period to the end of the month of May:

TABLE XI.—ONSETS OF TYPHOID FEVER CASES REPORTED TO CITY BOARD OF HEALTH.

Day.	1910.				1911.				
	September.	October.	November.	December.	January.	February.	March.	April.	May.
1,	......	......	......	4	16	28	5	2	3
2,	......	......	......	0	7	20	6	2	......
3,	......	......	......	2	8	23	3	0	......
4,	......	......	......	1	5	17	3	0	2
5,	......	......	......	2	7	27	6	2	.....
6,	......	......	......	2	9	18	6	3	......

TABLE XI—Continued.

Day.	1910.				1911.				
	September.	October.	November.	December.	January.	February.	March.	April.	May.
7,	......	......	......	0	5	13	4	4	......
8,	......	......	......	1	8	21	3	2	2
9,	......	......	......	0	5	14	3	2	......
10,	......	......	......	3	13	16	5	5	1
11,	......	......	......	0	4	19	3	3	2
12,	......	......	......	3	6	23	2	0	......
13,	......	......	......	0	5	21	6	2	......
14,	......	......	......	2	6	10	3	2	......
15,	1	......	1	3	18	22	1	6	......
16,	......	......	......	1	5	12	0	0	1
17,	......	......	......	0	10	14	5	0	......
18,	......	......	......	0	8	16	2	1	......
19,	......	......	......	2	4	10	1	0	......
20,	......	......	......	5	26	15	3	0	......
21,	......	......	1	1	16	5	0	0	1
22,	......	......	1	3	7	7	1	0	2
23,	......	......	......	3	16	2	1	0	......
24,	......	......	3	4	14	4	3	0	......
25,	......	......	1	14	24	4	3	0	......
26,	......	......	......	11	23	13	4	1	......
27,	......	......	......	4	15	8	1	1	......
28,	......	......	......	8	23	8	2	2	......
29,	......	......	......	3	18	......	1	0	......
30,	......	......	......	3	28	......	6	0	......
31,	......	......	......	6	14	......	2	0	......
Cases,	1	0	7	91	373	410	94	40	14
Deaths,	3	2	2	2	24	56	22	14	8

It was announced after the Department took charge of the water works, that the cases of fever would cease, (as far as the original infection was concerned) about the 20th of February. By reference to the table of onsets, it will be evident that such was substantially the fact.

The cases subsequent to this date were secondary to the original infection.

c.—Distribution of Cases by Age, Employment and District.

The cases were distributed evenly all over the city. There were 16 cases only that did not drink city water out of a total of 981 cases canvassed. Five hundred and fifty-three patients were males and 428 were females. By age periods the patients may be classified as shown in table XII.

TABLE XII.

Age Period	No. of Cases.
0 to 4,	28
5 to 9,	91
10 to 14,	149
15 to 19,	170
20 to 24,	160
25 to 29,	125
30 to 34,	78
35 to 39,	53
40 to 44,	43
45 to 49,	33
50 to 54,	26
55 to 59,	9
60 to 64,	11
65 to 69,	1
70 to 74,	4
Total number of cases,	981

Ninety-six properties on which typhoid fever occurred were without sewer connection. In each instance excrement was disposed of in privy vaults. There were 229 properties having sewer connection for kitchen drainage only. Inside closets not being provided, outside privy vaults were used.

Up to February 1st, there were 37 cases of typhoid fever of secondary origin and up to and including February 20th, there were 44 secondary cases in February.

The classification of patients according to their station or employment comprised nine, so-called occupations. These nine totaled 739 cases and the remainder of the cases were distributed among 54 different occupations. In 35 industrial establishments, among which typhoid fever was scattered, the largest number in any one shop or mill was 16, namely, at the Erie City Iron Works, where 700 men were employed. The 739 cases, classified among 9 principal occupations, were as follows:

At school,	243 cases
Housewife,	148 cases
Laborers,	125 cases
At home,	96 cases
Clerks,	54 cases
Machinists,	19 cases
Moulders,	19 cases
Firemen,	18 cases
Teamsters,	17 cases
	739 cases

There are 19 public schools at Erie in which 7,000 pupils are instructed. There are also 15 parochial schools, where 3,600 pupils are taught. There was typhoid fever among the scholars at each school, the largest number being 21 at the public school, corner of Tenth and Cascade streets. The average number in the public schools was 8 for each building and for the parochial schools, 4 for each building.

The Department's engineers made an inspection at each school property, gave instructions where necessary, relative to sanitation and hygiene. Class lists were secured, all causes of absence from school were noted, typhoid fever was checked up, with respect to the room at the school, the habits of the child or student, both at school and at home. The common drinking cup was ordered abolished, faucets on the public supply were closed and the authorities were instructed to supply boiled or pure spring water. After an extended study it was concluded that all possible was being done to prevent secondary infection among the school children.

d.—Typhoid Fever in the County.

Out of 21 townships in the county 63 cases of typhoid fever were reported for September 1910 to May 1911 inclusive, 5 townships being free from typhoid during this period. From Mill Creek township which surrounds Erie city there were 25 cases reported as follows: 1 for September, 1 for October, 1 for November, 1 for December, 4 for January, 13 for February and 4 for March.

For 13 boroughs in the county 8 cases only were reported during the period mentioned, one being from Mill Village, 5 from North East and 2 from Union City. One may look with some suspicion on these records and harbor the thought that physicians did not report for the months of December, January, February and March in the boroughs and in Corry city. Table XIII shows the distribution of the county cases by months:

TABLE XIII.—CASES OF TYPHOID FEVER REPORTED FROM COUNTY DISTRICTS.

Month.	Townships.	Boroughs.	Total.
September,	9	2	11
October,	5	3	8
November,	5	3	8
December,	7	....	7
January,	9	....	9
February,	21	....	21
March,	6	....	6
April,	1	....	1
May,	0	....	0
Total,	63	8	71

PART III. MEASURES BOTH TEMPORARY AND PERMANENT ENFORCED BY STATE DEPARTMENT OF HEALTH TO ASSURE THE PURITY OF THE PUBLIC WATER SUPPLY.

1. Temporary Chemical Sterilizing Plant.

In view of the information in possession of the Commissioner of Health prior to the outbreak of the typhoid fever epidemic, it was taken for granted that the source of infection was the public water supply. Subsequent investigations as hereafter shown, fully corroborate this opinion.

Assistant Engineer, Ralph E. Irwin, was commissioned to set up and put in operation two temporary chemical sterilizing plants for the disinfection of the water supplied to the public in Erie at the pumping station. This apparatus was installed and at 11:50 o'clock on the evening of Saturday, January 28th, all of the water being supplied to the public was treated at the pumping station with solutions of copper sulphate in proportion by weight of two parts to a million. This process was kept up until March 15th when the city had installed under orders by the Commissioner of Health, as will later appear, an approved plant of a more permanent character for the treatment of the water with chlorinated lime.

During Saturday, January 28th, before the germicide was applied, samples of raw water and of tap water were collected and sent to the Department's laboratories and subsequently similar samples were collected throughout the season totalling approximately 2,000. In the vast majority of cases water was found to be free of contamination. Thirteen samples only out of a total of 1,432 samples collected of treated water showed the presence of B. Coli.

On January 28th, 22 samples were collected and analyzed, four showing the presence of sewage pollution. Two of these polluted samples were collected from the pump well at the station; one was tap water from the Reed House (the principal hotel of the city located in the low service district) and the other was from a dead end in the high service district. So out of four samples collected at the pump wells on January 28th, before the germicide was applied, two samples showed pollution. Out of eleven samples collected from taps in the low service district, one only showed sewage pollution, namely at the Reed House; and out of three samples collected in the high service district, the water having first passed through the distributing reservoirs, two samples being of water collected at dead ends, one sample only,—that from the tap, at the corner of Thirty-second and Liberty Streets,—was contaminated. Four samples were collected from the top layers of water in the distributing reservoirs. Naturally they were free from pollution. A coating of ice twelve inches or more in thickness covered the surface of these basins.

The city uses between twelve and fifteen million gallons of water daily. The pollution of the supply would, as hereinafter shown, be momentary only, so to speak; hence this polluted water would not likely reach dead ends to any extent because the water here would not be much used; but along the lines of the large pipes and in the districts where the draft upon the mains is extensive, the polluted water of the short and intermittent period would find its avenue of escape from the distributing system and hence it is not strange that a few days after such pollution occurred little bacteriological evidence was forthcoming to tell the story. Undoubtedly had hundreds upon hundreds of samples been taken all over the city, the polluted water would have been more extensively detected.

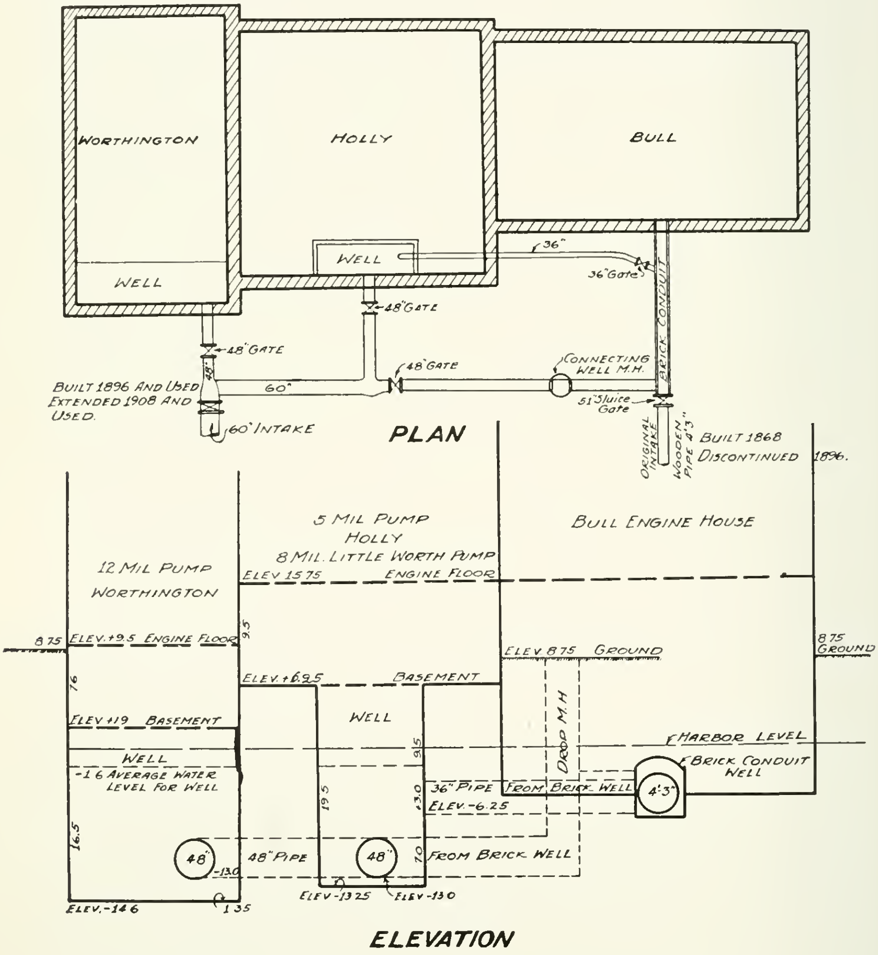
Copper sulphate solutions were used for several reasons. One reason was that enormous quantities of the chemical were stored in Erie available for any purpose. Another reason was that this chemical was known by the Department to be efficacious as a disinfectant of a water pipe system. Its force does not seem to be expended within the first few minutes of its application to the water. Furthermore, at Erie the chemical has to be applied at the pumps but a few minutes removed from the service taps to dwellings drawing their water from the force main. Since the application of the chemical was temporarily to be left with inexperienced men, there was less likelihood in the opinion of the Department that objections would arise from the water consumers if copper sulphate was applied.

Furthermore, the water pipes of the Erie water works are almost filled at a few places with a species of water snails, Bithynia tentaculata (L), a European form, which was introduced into this country some time ago. The masses of snails living, dying, and decaying in the pipes, is almost beyond belief. There are millions of them at some points clogging the pipes at times. This furnishes, in all probability a splendid breeding place for various microorganisms, and the lake water is filtered through this mass of foul substance. Any one wishing to pursue this subject may refer to notes published by Dr. V. Sterki and Dr. A. E. Ardmann in Nautilus Vol. 24, January, 1911, page 100. In the opinion of the Department, solutions of copper sulphate were preferable to any other solution as a disinfectant and germicide to destroy bacterial life throughout the water pipes under the circumstances obtain in Erie during the first few days efforts to rid the pipe system of sewage contamination.

Charles H. Lawall, the Department's chemist, conducted experiments with Lake Erie water to ascertain the amount of copper sulphate which could be safely

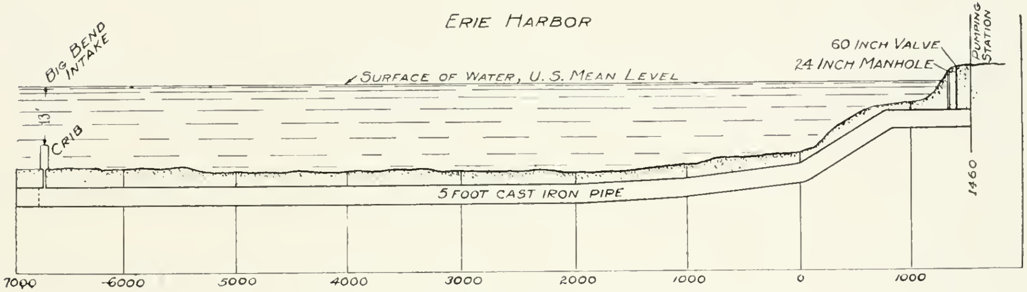
(SKETCH I)

ERIE, PENNA. WATER WORKS
PLAN AND ELEVATIONS AT PUMP WELLS AND CONNECTIONS 1911.

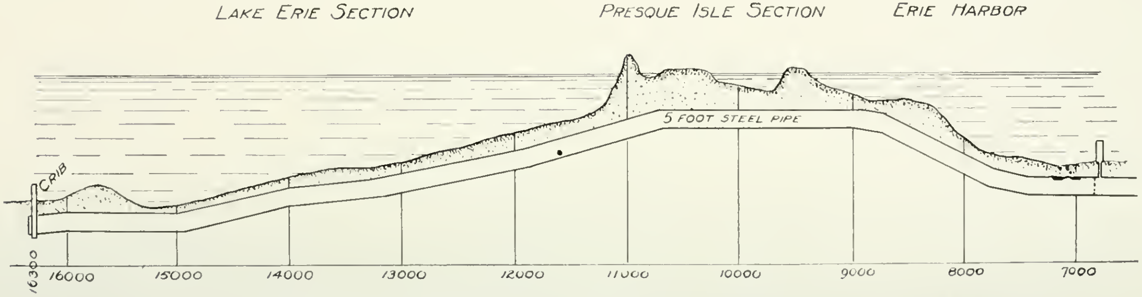


(SKETCH II)

SKETCH OF INTAKE, ERIE, PENNA. WATER WORKS, JAN. 1911.



SECTION COMPLETED IN 1896.



SECTION COMPLETED AND WATER TURNED ON SEPT. 16, 1908.

added to the water without prejudice to the public health. He reported five parts in a million. At no time did the Department apply more than 2.5 parts of the chemical to a million of the water.

The big Worthington pump well is 17 feet deep and is supplied through a 48 inch pipe connecting to the 60 inch intake pipe. The Holly pump well is about the same depth and has a 48 inch connection to the 60 inch intake pipe and to the old brick conduit, a branch also connects said brick conduit to the 48 inch Worthington pump well connection. The Holly pump well also has an independent 36 inch connection to the brick conduit, this 36 inch pipe enters the well 7 feet above the bottom. The 48 inch pipe enters at the bottom. The 48 inch pipe also enters at the bottom of the Worthington pump well.

The old Cornish Bull pumps have been disconnected for 15 years or more.

The pump well and original intake for the Bull engines were constructed in 1868. See sketch I. Beginning inside the building there are 52 feet of brick conduit 14 feet in diameter, built about half in rock excavation, terminating near the old bulk head at a sluice gate. Continuing there are 590 feet of wood stave pipe 4.25 feet in diameter laid in timber crib construction resting on rock. Thence the water getting deeper the construction is cast iron pipe 4 feet in diameter for 333 feet laid on piers about 100 feet apart, making a total length of 975 feet. The top of the outer end of the intake is 4 feet below the level of the harbor. The top of the cribbing is 6 feet above this level. As the intake approaches the shore it ascends until the top is nearly that of the harbor level. The bottom of the brick conduit is minus 7. The 36 inch pipe and the 48 inch pipe leave this conduit about one foot above its bottom. The 36 inch pipe terminates at the Holly pump, well at about minus 6. But the 48 inch pipe enters the same well and also the Holly pump well at minus 13. Usually the level of the water in these two pump wells is 20 inches lower than the level of the water in the harbor but it flucututates, sometimes being lower. Hence if there were any leaks at the old sluice gate or at the other gates kept closed to keep out harbor water there might be an inflow of sewage polluted water to the Holly and Worthington pump wells. Copper sulphate applied at the suction of the pumps would reach any pollution no matter from what source.

There are two suction pipes into the Worthington pump well, one a 30 inch to the 10 million Worthington and the other a 24 inch to the 8 million Worthington. An ordinary whiskey barrel for mixing purposes was set up on the engine room floor and the solution was piped to a feeding barrel placed between the two suctions on the basement floor. The feeding pipes were so arranged that the liquid could be fed to either one or both of the suction pipes. The two pumping engines were seldom operated at the same time. In the Holly engine room both barrels were placed in the basement but the feed was into the suction pipe of the Holly pump. This apparatus was kept in use until the 15th day of March. In sketch I the plan and elevation of the pump wells and connections are shown.

2. The Present Lake Intake and Sedimentation Basin.

The water furnished to the city comes from the lake a mile off the shore of Presque Isle. See sketch II. The intake was completed and water turned on September 16th, 1908, and consists of 9,324 feet of 60 inch riveted steel pipe connected to 8,307 feet of cast iron pipe of the same size which terminates at a sump for the pumps at the pumping station on the harbor shore of the main land. The steel main terminates in a crib 40 by 40 feet in plan and 19 feet deep placed on the bottom of the lake where there is a depth of 35 feet of water, insuring a depth of water over the intake of 26 feet. From this intake the steel main extends across Presque Isle which separates the lake from the harbor and on which are located two settling basins into which water may be by-passed from the main. The 60 inch steel line continues about a half a mile under the harbor to the cast iron pipe line where the old intake completed in 1896 was located. This was abandoned when the lake water was turned on. The present capacity of the main is 29 million gallons in 24 hours but this can be increased to 55 million gallons by modifications at the discharge end which limits the capacity at present. In 1904, the city let a contract for extending the intake pipe from Big Bend Crib to a point in Lake Erie one mile north of the peninsula. The lake water was shown to be superior to the harbor water in every particular except turbidity. The plans adopted contemplated the construction of one or more sedimentation basins on the peninsula. The water board believed that a continuous flow of water through a sedimentation basin at a velocity of about 15 feet per minute would remove over 90 per cent. of the turbidity. By the close of the year 1907, a large amount of excavation had been made for sedimentation basin No. 1. On September 16, 1908, when lake water was turned into the new pipe line or soon after, one of the sedimentation basins was put in use and the second basin was nearing completion. At the close of the year 1909, both of the basins were in use. They were little more than holes excavated in the ground. The bottoms and sides were of earth and the grades were uneven. During 1910, some vegetable growth developed in the settling basins so one was put out of commission and the other one was used until October when it also was put out of commission. It was believed that the sandy bottom and sides contributed to the growth, hence a contract was entered into September 28th, 1910 to have the sides and bottom of the east settling basin cemented. The contractor was represented on the ground all winter. Cold weather interfered with operations. It was not until Saturday, March 11th, that the contractors began pumping out the east basin.

The water level in the east basin (known as Number One which is the only one to be improved and used) will be somewhat below lake level, depending upon the loss through friction in the supply main. The bottom is at elevation 14 below lake level. The water is admitted through a valve bypass connection from the 60 inch steel pipe and is distributed across the inner end of the basin through a submerged pipe having an opening spaced uniformily along its entire length. Water was taken off from the opposite end of the basin through a similar connection through the 60 inch steel pipe. The basin is 656 feet long by 466 feet wide at the top and 510 by 320 feet wide at the bottom. The capacity is about 24,000,000 gallons. This basin was completed and used about October 2nd, 1911. As will be seen from sketch III there is an emergency intake at the peninsula shore of the harbor. So there are two places at which water may be admitted to the pump wells at present. First, at the lake intake and second, at the emergency intake, Erie harbor. Up to February 6th of this year water could have been admitted at the sluice gate between the wooden pipe and brick conduit but on this date the 48 inch and 36 inch openings in the brick conduit were closed by brick masonry to prevent any harbor water being admitted from the original intake.

3. Distribution of the Water.

The distributing system comprises a high service and a low service. The high service embraces the suburban district at the far end of town opposite from the lake front and is supplied by direct pumpage through a 24 inch force main, which extends from the pumping station to this district. The low service district embraces the business, industrial and main residental section of the city and is supplied through a 20 inch and 30 inch force main which extends from the pumping station to the reservoir but feed water most of the time directly into the mains in the low district. The two systems are connected together by a series of check valves which in the case of an emergency would let the water from the low service into the high service system.

The Holly pump and the small Worthington may be used for both high and low services, but the larger Worthington is used for the low service only, the pumps working under a pressure of 105 pounds on the low and from 125 to 130 pounds on the high service. In Table XIV is given the average daily pumpage and the population by years for the last 12 years:

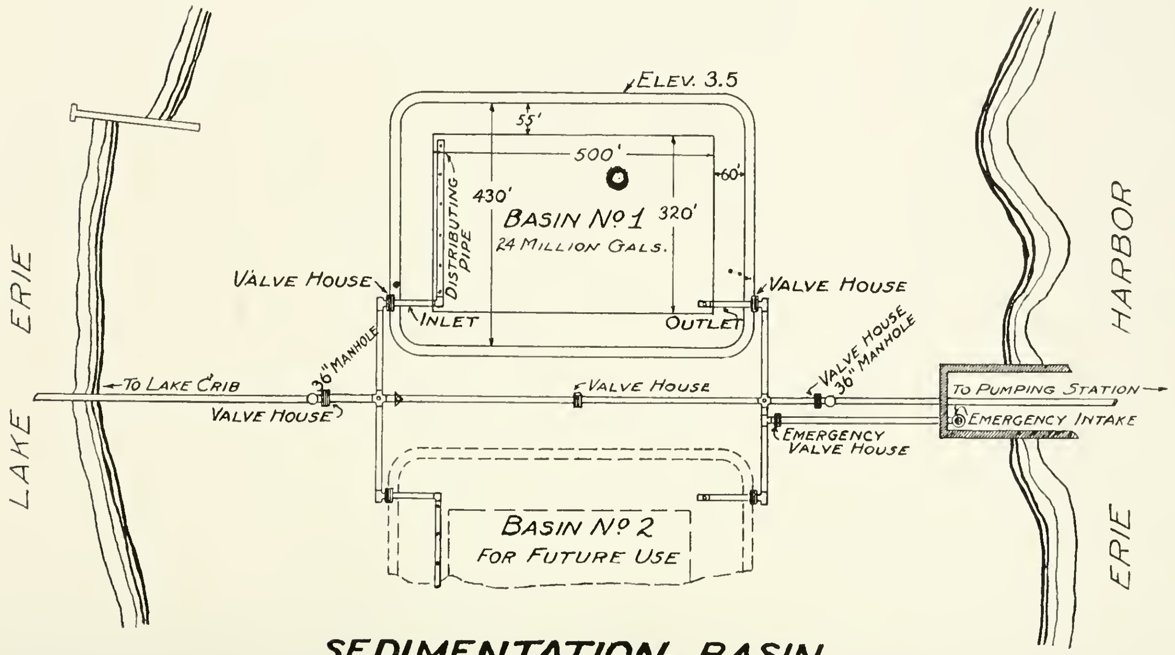
TABLE XIV.

AVERAGE DAILY PUMPAGE IN MILLION GALLONS.

Year.	Average Daily Pumpage.	Population.
1900,	8.55	52,733
1901,	8.74	54,100
1902,	8.83	55,500
1903,	9.83	56,900
1904,	10.1	58,200
1905,	10.5	59,600
1906,	11.3	61,000
1907,	11.8	62,400
1908,	12.3	63,800
1909,	12.7	65,100
1910,	13.7	66,525
1911,	14.6	68,000

Raw water in both high and low service districts is pumped directly into the mains. In the high service the surplus overflows into the reservoir; in the low service the pump speed in regulated to meet the demands of the consumption. About two thirds of the daily consumption occurs in the low district. Even in the high service sedimentation would not be likely to prove much of a barrier to the transmission of infection since the raw water goes to the consumers first. In table XV is given the daily pumpage into the high and low service districts for four months of the winter of 1910-11.

(SKETCH III)



SEDIMENTATION BASIN
EXCAVATED AND FIRST USED 1908.
CONCRETE LINED 1911 - IN USE SINCE OCT. 3, 1911.

TABLE XV.

PUMPAGE INTO HIGH AND LOW SERVICE DISTRICTS

In Million Gallons for 24 hours.

Day.	November 1910.				December 1910.				January 1911.				February 1911.			
	Low Service.		High Service.		Low Service.		High Service.		Low Service.		High Service.		Low Service.		High Service.	
	Little Worthington Pump.	Big Worthington Pump.	Little Worthington Pump.	Holly Pump.	Little Worthington Pump.	Big Worthington Pump.	Little Worthington Pump.	Holly Pump.	Little Worthington Pump.	Big Worthington Pump.	Little Worthington Pump.	Holly Pump.	Little Worthington Pump.	Big Worthington Pump.	Little Worthington Pump.	Holly Pump.
1,	....	7.3	1.8	2.8	....	10.4	3.4	....	......	9.6	....	4.1	....	7.6	1.8	3.0
2,	....	10.4	....	4.1	....	10.3	3.8	....	......	8.2	....	4.4	....	10.8	4.5	....
3,	....	10.4	....	4.1	....	9.2	3.7	....	......	9.4	....	4.6	....	10.6	4.8	....
4,	....	10.4	2.5	1.3	....	8.7	3.5	....	......	8.1	....	4.7	....	10.3	4.7	....
5,	....	10.3	3.7	....	....	9.9	3.8	....	......	9.0	....	4.8	....	6.9	3.7	....
6,	....	9.2	3.3	....	....	10.1	3.8	....	......	10.7	....	4.5	....	0.6	3.1	....
7,	....	10.0	3.4	....	....	10.0	4.4	....	......	9.6	....	5.0	....	10.4	4.0	....
8,	....	5.8	4.0	....	....	9.3	3.8	....	......	10.4	....	4.6	....	7.8	3.5	....
9,	....	....	5.8	....	....	9.9	3.9	....	......	10.5	....	5.0	....	10.7	4.1	....
10,	5.9	....	1.5	4.0	....	9.8	4.1	....	......	10.2	2.2	2.2	....	11.8	5.3	....
11,	7.5	....	....	5.7	....	9.6	1.8	2.2	......	10.0	3.9	....	....	10.8	4.3	....
12,	7.4	....	....	5.8	....	9.5	....	4.1	......	9.7	3.7	....	....	8.4	3.1	....
13,	2.7	6.1	....	5.5	....	10.0	....	4.4	......	9.4	2.6	1.3	....	9.5	3.4	....
14,	....	10.4	....	5.2	....	9.7	....	4.8	5.7	1.9	....	4.6	....	9.4	3.8	....
15,	....	10.1	....	5.2	....	10.7	....	4.8	7.5	....	....	4.6	....	10.0	3.8	....
16,	....	9.8	....	5.5	....	10.8	....	4.9	7.8	....	....	5.5	....	9.4	3.6	....
17,	....	10.3	....	5.5	....	10.6	....	4.4	8.2	....	....	6.1	....	9.4	3.6	....
18,	....	10.0	....	5.4	....	10.0	....	3.8	8.1	....	....	6.2	....	9.0	3.6	....
19,	....	10.3	....	4.8	....	10.4	....	4.4	3.7	5.8	....	5.9	....	7.7	3.2	....
20,	....	8.0	....	4.7	....	10.2	....	4.8	......	10.7	....	4.9	....	10.0	3.0	1.0
21,	....	9.8	....	5.0	....	10.2	....	4.8	......	10.7	....	4.7	....	9.8	4.6	....
22,	....	9.9	....	5.1	....	10.0	....	4.7	......	10.5	....	4.0	....	10.9	4.5	....

TABLE XV.—Continued.

PUMPAGE INTO HIGH AND LOW SERVICE DISTRICTS

In Million Gallons for 24 hours.

Day.	November 1910.				December 1910.				January 1910				February 1911.			
	Low Service.		High Service.		Low Service.		High Service.		Low Service.		High Service.		Low Service.		High Service.	
	Little Worthington Pump.	Big Worthington Pump.	Little Worthington Pump.	Holly Pump.	Little Worthington Pump.	Big Worthington Pump.	Little Worthington Pump.	Holly Pump.	Little Worthington Pump.	Big Worthington Pump.	Little Worthington Pump.	Holly Pump.	Little Worthington Pump.	Big Worthington Pump.	Little Worthington Pump.	Holly Pump.
23, ...	....	9.9	....	5.0	....	9.7	....	4.8	5.0	3.6	....	4.8	....	11.0	5.8	....
24, ...	....	8.7	....	4.2	....	9.3	....	4.6	7.9	....	....	5.4	....	10.7	6.1	....
25, ...	....	9.6	....	4.3	....	8.9	....	3.9	3.4	5.4	....	4.9	....	10.6	5.5	....
26, ...	....	9.6	....	4.3	....	8.9	....	3.5	......	9.7	....	4.0	....	10.8	5.5	....
27, ...	....	9.0	....	3.7	....	9.6	....	4.3	......	9.8	....	3.8	....	11.3	5.3	....
28, ...	....	9.6	....	4.1	....	9.1	....	4.5	......	9.4	....	4.6	....	11.2	5.5	....
29, ...	....	9.3	2.3	1.5	....	9.2	....	4.4	......	8.3	....	3.8	....	....	....	....
30, ...	....	10.4	3.3	....	....	8.1	....	4.4	......	9.8	....	4.4	....	....	....	....
31, ...	....	....	....	....	....	10.8	....	4.5	......	10.4	....	4.7	....	....	....	....
Totals, ...	23.5	244.6	31.6	106.8	....	302.9	40.0	91.0	57.3	230.8	12.4	132.1	....	267.4	117.7	4.0
Total low, ...	....	268.1	....	....	....	302.9	....	....	......	288.1	....	....	....	267.4	....	....
Total high, ...	....	....	....	138.4	....	....	....	131.0	......	....	....	144.4	....	....	....	121.7
Grand total, ...	....	406.5	....	....	....	433.9	....	....	......	432.5	....	....	....	389.1	....	....

The reservoir is located on the highest land in the city. It was built in 1873 and is about two miles distant from the pumping station. The bottom is 210 feet above the normal level of the Harbor water. The reservoir is constructed partly in excavation but mostly in embankment with earth slopes lined on the interior with brick and cement and sodded on the top and exterior. The dimensions on top at the water level are 547.7 feet by 402 feet. The top of the embankments is 3 feet high. Nine feet below this high water line which is elevation 238, a submerged dividing wall built of earth with paved sloping sides is just exposed to view dividing the reservoir into two compartments the capacty of each being 10.5 million gallons. When full to 28 feet in depth the reservoir holds 34.5 million gallons. When 27 feet deep the capacity is 33,000,000 gallons. When the water is 19 feet deep or just to the top of the dividing wall there are stored 21,000,000 gallons.

Nineteenth Street is the dividing line between the two services. So far as quality of water is concerned there can be but little difference in the two districts. The water comes raw to both in about the same time. In Table XVI is given the readings in depth in feet of water in reservoir taken twice each day for four months during the winter of 1910-11, from which it will be seen that there was very little fluctuation. Furthermore, the water is drawn off about five feet from the bottom of the reservoir through the same pipe that admits the water to the basin.

TABLE XVI.

DEPTH OF WATER IN FEET IN STORAGE RESERVOIR.

HIGH SERVICE DISTRICT.

Day.	November.		December		January.		February.	
	7 A. M.	7. P. M.	7 A. M.	7. P. M.	7 A. M.	7. P. M.	7 A. M.	7. P. M.
1,	26.5	24.6	25.9	25.5	26.2	26.2	26.6	24.3
2,	25.3	24.5	26.0	25.6	26.6	26.5	23.8	23.6
3,	25.2	24.8	26.2	25.5	26.6	26.4	24.6	24.5
4,	25.7	24.7	25.4	25.7	26.6	25.4	25.7	26.1
5,	25.5	26.0	26.3	25.4	25.7	24.6	26.5	26.3
6,	26.1	26.3	25.4	25.5	24.9	24.6	24.4	....
7,	26.6	26.0	26.0	25.7	25.2	24.8	....	15.0
8,	26.6	24.7	26.3	25.5	25.4	26.0	16.0	17.0
9,	23.4	....	25.7	25.3	26.6	26.2	15.0	18.0
10,	....	....	25.7	25.5	26.6	26.2	18.0	14.0
11,	....	....	25.9	26.1	26.6	26.2	19.5	15.0
12,	....	....	26.1	25.2	26.3	26.2	15.4	15.8
13,	....	....	25.6	25.0	26.7	26.3	15.5	16.0
14,	21.1	20.8	25.4	24.9	26.7	23.5	15.5	15.7
15,	21.5	21.5	25.4	25.2	25.7	25.5	15.5	16.3
16,	22.8	22.4	25.7	25.6	25.6	24.5	15.0	15.7
17,	23.5	23.2	26.2	25.7	24.7	24.0	16.8	15.8
18,	24.2	24.0	26.1	26.1	24.7	23.6	16.3	16.2
19,	24.9	24.8	26.4	25.8	24.1	24.1	16.0	15.2
20,	25.7	25.3	26.3	25.9	24.8	25.8	16.5	15.6
21,	26.1	25.4	26.4	25.9	26.2	25.6	17.9	17.3
22,	25.9	25.5	26.4	26.1	26.4	25.5	18.3	16.3
23,	26.1	25.8	26.5	26.1	26.8	24.8	18.3	18.3
24,	26.2	26.2	26.6	26.2	25.5	26.1	18.3	18.3
25,	26.5	26.1	26.5	26.5	26.4	25.7	18.3	17.3
26,	26.4	26.1	26.6	26.4	26.3	25.7	20.3	22.3
27,	26.2	26.4	26.7	26.3	26.2	25.8	24.8	23.2
28,	26.5	25.8	26.6	26.0	26.3	26.0	24.5	25.1
29,	28.8	25.4	26.4	25.9	26.6	26.4	....	....
30,	25.9	25.5	26.4	25.4	26.7	25.9	....	....
31,	....	....	25.7	25.6	26.5	24.3	....	....
Total,	659.2	621.8	812.1	797.1	806.2	788.4	523.3	504.6
Maximum,	28.8	26.4	26.7	26.5	26.8	26.5	26.6	26.3
Minimum,	21.1	20.8	25.4	24.9	24.1	23.5	15.0	14.0
Average,	25.4	24.9	26.2	25.7	26.0	25.4	19.4	18.7

During December the average fluctation in depth of water in the reservoir between 7 o'clock in the evening and 7 o'clock the next morning amounted to less than six-tenths of a million gallons and it was about this for the month of January with two or three exceptions. The point emphasized is that there is substantially little difference in quality of water supplied to the high and low service districts.

4. Analyses of Water Treated with Copper Sulphate.

Hereinbefore has been stated the amount of pollution found in the samples of water collected by the Department before the germicide was applied at the pumping station. The chlorinated lime treatment superseded the copper sulphate treatment on March 15th. In Table XVII is given the number of samples of water treated with copper sulphate drawn from taps about town up to March 15th, when the copper sulphate treatment ceased, and the results of the tests for bacteria, total and B. Coli:

TABLE XVII.

BACTERIAL ANALYSES OF WATER TREATED WITH COPPER SULPHATE.

Date of Collection.	Samples.		Bacteria per c. c.					
			Total.			B. Coli.		
	No. Collected.	B. Coli Found.	Average.	Maximum.	Minimum.	Average.	Maximum.	Minimum.
1911:—								
January 30,	15	0	14	24	3	0	0	0
January 31,	15	0	44	400	4	0	0	0
February 1,	15	0	277	3000	6	0	0	0
February 2,	14	1	33	150	8	1	1	1
February 3,	*	....	....	....	....	....	....	....
February 4,	16	0	12	36	4	0	0	0
February 5,	14	0	26	200	4	0	0	0
February 6,	16	1	19	60	2	4	4	4
February 7,	16	0	14	30	4	0	0	0
February 8,	16	0	12	60	4	0	0	0
February 9,	16	0	21	44	8	0	0	0
February 10,	16	1	50	250	10	6	6	6
February 11,	15	0	34	80	12	0	0	0
February 12,	15	0	51	170	8	0	0	0
February 13,	15	0	71	600	6	0	0	0
February 14,	16	0	8	24	4	0	0	0
February 15,	15	0	25	120	0	0	0	0
February 16,	14	0	13	40	6	0	0	0
February 17,	15	0	77	980	4	0	0	0
February 18,	17	0	40	420	4	0	0	0
February 19,	16	0	15	100	3	0	0	0
February 20,	16	0	14	60	6	0	0	0
February 21,	16	1	12	30	4	1	1	1
February 22,	16	0	24	180	4	0	0	0
February 23,	16	0	10	20	2	0	0	0
February 24,	16	1	7	24	1	1	1	1
February 25,	16	2	12	32	2	3.5	4	3
February 26,	16	0	58	720	2	0	0	0
February 27,	16	0	52	210	6	0	0	0
February 28,	16	0	10	24	2	0	0	0
March 1,	16	0	55	500	3	0	0	0
March 2,	15	0	10	12	2	0	0	0
March 3,	16	0	5	12	0	0	0	0
March 4,	16	0	6	30	1	0	0	0
March 5,	16	0	4	10	1	0	0	0
March 6,	16	0	7	20	2	0	0	0
March 7,	16	0	23	280	0	0	0	0
March 8,	16	0	9	40	1	0	0	0
March 9,	15	0	6	24	1	0	0	0
March 10,	16	0	28	280	2	0	0	0
March 11,	16	0	19	180	1	0	0	0
March 12,	2	0	6	6	6	0	0	0
March 13,	10	0	18	44	8	0	0	0
March 14,	10	0	83	600	4	0	0	0

* No collection.

Six hundred and forty-five samples were collected and in 7 of them only were B. Coli found. The largest number in any one sample was six per c. c. This result proves that there was supplied to the people from January 29th to March 15th a water practically free from contamination.

The untreated water in the mains was flushed out by the Water Commissioners. Twenty days were spent in emptying the reservoir and cleaning it. Samples of water collected from the reservoir before and after cleaning were analyzed. They are given in Table XVIII. The water after reservoir cleaning was all treated water.

TABLE XVIII.

ANALYSES OF RESERVOIR WATER.

Date of Collection.	Sample.	Bacteria per c. c.	
		Total.	B. Coli.
1911.			
January 28,	East Basin surface water,	8	0
	East Inlet surface water,	12	0
	West Basin surface water,	4	0
	West Inlet surface water,	6	0
January 29,	East Basin surface water,	3	0
	East Inlet surface water,	6	0
	West Basin surface water,	10	0
	West Inlet surface water,	4	0
January 30,	East Basin surface water,	3	0
	East Inlet surface water,	6	0
	West Basin surface water,	10	0
	West Inlet surface water,	4	0
January 31,	East Basin surface water,	8	0
	East Inlet surface water,	150	0
	West Basin surface water,	20	0
	West Inlet surface water,	60	0
February 1,	East Basin surface water,	24	0
	East Inlet surface water,	20	0
	West Basin surface water,	300	0
	West Inlet surface water,	2	0
February 2,	East Basin surface water,	140	0
	West Basin surface water,	6	0
February 4,	East Inlet surface water,	18	0
	West Basin surface water,	8	0
	West Inlet surface water,	10	0
February 5,	East Basin surface water,	24	0
	East Inlet surface water,	12	0
	West Basin surface water,	0	0
	West Inlet surface water,	20	0
February 6,	Drain ditch to sewer bottom water,	24	3
	Drain ditch to sewer bottom water,	12	0
February 7,	Drain ditch to sewer bottom water,	6	0
	Drain ditch to sewer bottom water,	6	0
February 9,	Mud east side bottom water,	11,200	0
	Mud east side bottom water,	12,600	0
February 19,	Mud west side bottom water,	2,000	0
	Mud west side bottom water,	3,800	0
February 26,	East Basin surface water,	10	0
	West Basin surface water,	8	0
February 27,	West Basin surface water,	12	0
February 28,	Reservoir surface water,	6	0
	Reservoir surface water,	6	0
March 1,	Reservoir surface water,	4	0
	Reservoir surface water,	14	0
March 2,	Reservoir surface water,	4	0
March 3,	Reservoir surface water,	8	0
March 4,	Reservoir surface water,	4	0
March 5,	Reservoir surface water,	2	0
March 6,	Reservoir surface water,	3	0
March 7,	Reservoir surface water,	2	0
March 8,	Reservoir surface water,	20	0
March 10,	Reservoir surface water,	6	0
March 11,	Reservoir surface water,	2	0

5. Analyses of Raw Lake Water.

The quality of the raw water is shown by turbidity tests and bacteriological examination. The latter were begun on January 28th. The former have been read daily by the city for a number of years. In table XIX the turbidities are shown of the lake water prior to and during the epidemic of winter cholera and typhoid fever.

TABLE XIX.

TURBIDITY OF RAW LAKE WATER—SILICA STANDARD.

1. Holly Well. 2. Worthington Well.

	November.			December.			January.			February.		
		Well.			Well.			Well.			Well.	
	Lake.	No. 1.	No. 2.	Lake.	No. 1.	No. 2.	Lake.	No. 1.	No. 2.	Lake.	No. 1.	No. 2.
1, ...	10	10	12	55	64	82	......	......	......	10	10	10
2, ...	8	8	8	56	62	70	14	14	10	10	10	28
3, ...	18	14	14	58	50	54	14	14	10	24	22	48
4, ...	14	10	10	50	32	20	18	14	16	42	......	24
5, ...	14	14	14	45	26	20	14	16	12	18	......	20
6, ...	10	9	10	50	50	58	12	16	10	14	......	1[illegible]
7, ...	8	8	8	50	51	68	20	20	14	10	......	10
8, ...	10	10	10	45	51	62	22	22	14	10	......	8
9, ...	6	6	6	45	......	......	24	26	......	10	......	8
10, ...	8	8	8	40	......	......	26	26	24	8	......	8
11, ...	18	18	18	......	......	......	18	18	22	8	......	8
12, ...	14	14	14	16	52	58	18	20	22	6	......	8
13, ...	12	250	250	14	50	56	16	18	20	8	......	8
14, ...	42	58	108	12	50	50	18	18	18	8	......	6
15, ...	30	40	40	22	30	30	16	14	16	6	......	6
16, ...	55	102	94	18	30	30	16	16	14	6	......	......
17, ...	55	135	135	36	42	42	12	12	8	6	......	6
18, ...	58	62	55	30	48	46	10	10	4	6	......	6
19, ...	54	55	55	30	61	61	4	4	4	4	......	4
20, ...	56	55	52	32	61	61	4	5	6	4	......	4
21, ...	34	20	20	38	38	38	10	10	10	4	......	4
22, ...	38	30	34	28	42	44	10	10	10	4	......	4
23, ...	41	41	60	20	18	18	8	8	8	4	......	6
24, ...	68	40	30	22	36	39	8	8	8	4	......	6
25, ...	50	36	28	......	......	......	8	8	8	4	......	6
26, ...	46	180	160	26	40	45	6	6	6	......	......	6
27, ...	36	56	60	32	50	49	4	4	6	6	......	6
28, ...	18	18	26	32	28	36	......	......	10	8	......	8
29, ...	18	26	30	26	20	20	8	8	8	......	......	......
30, ...	89	47	47	22	24	24	8	8	8	......	......	......
31, ...	......	......	......	22	26	26	12	12	12	......	......	......
	938	1380	1416	972	1132	1207	378	379	338	252	42	280
Maximum, ...	89	250	250	58	64	82	24	26	24	42	22	48
Minimum, ...	6	6	6	12	18	18	4	4	4	4	10	4
Average, ...	31	44	47	32	42	44	13	13	11	9	14	10

Table XX shows the quality of the raw water supplied to the public as tested by the State Department of Health up to the time that the Water Board established its laboratory and started to treat the water with hypo-chlorites of lime:

TABLE XX.

QUALITY OF RAW LAKE WATER ANALYZED BY STATE DEPARTMENT OF HEALTH.

Date Collection.	Location of Sample.							
	Presque Isle.		Pumping Station.					
			M. H. on 60 in. supply main.		Worthington Pump Well.		Holly Pump Well.	
	Bacteria.		Bacteria.		Bacteria.		Bacteria.	
1911:—	Total.	B. Coli.	Total.	B. Coli.	Total.	B. Coli.	Total.	B. Coli.
January 28,	....	....	....	....	100	0	140	4
January 28,	....	....	....	....	160	3	70	0
January 29,	24	0	....	....	36	0	80	0
January 29,	20	0	....	....	50	0	18	0
January 30,	12	0	16	0	....	....	....	....
January 30,	20	0	30	0	....	....	....	....
January 31,	20	0	16	0	24	2	20	2
January 31,	28	0	42	0	....	....	....	....
February 1,	32	0	10	0	....	....	....	....
February 1,	12	0	40	0	....	....	....	....
February 2,	24	0	60	0	70	0	....	....
February 2,	14	0	12	0	....	....	....	....
February 3,	200	0	....	....	....	....	....	....
February 3,	100	1	....	....	....	....	....	....
February 4,	60	3	34	0	24	0	....	....
February 4,	36	0	16	0	....	....	....	....
February 5,	300	0	800	0	60	0	....	....
February 5,	600	0	180	0	....	....	....	....
February 6,	10	0	22	1	24	0	....	....
February 6,	6	0	24	0	....	....	....	....
February 7,	88	....	20	....	80	....	....	....
February 7,	12	....	80	....	....	....	....	....
February 8,	10	0	32	0	14	0	....	....
February 8,	20	1	10	0	....	....	....	....
February 9,	40	0	56	0	30	0	....	....
February 9,	30	0	60	2	....	....	....	....
February 10,	28	0	120	4	60	0	....	....
February 10,	70	0	80	0	....	....	....	....
February 11,	12	0	630	0	40	0	....	....
February 11,	22	0	240	6	....	....	....	....
February 12,	24	0	700	0	10	0	....	....
February 12,	20	0	32	0	....	....	....	....
February 13,	40	0	20	0	140	0	....	....
February 13,	20	0	80	0	....	....	....	....
February 14,	12	0	8	0	10	0	....	....
February 14,	16	0	12	2	....	....	....	....
February 15,	84	0	84	1	16	0	....	....
February 15,	48	0	14	0	....	....	....	....
February 16,	16	0	8	0	36	0	....	....
February 16,	112	0	22	0	....	....	....	....
February 17,	180	1	....	....	8	0	....	....
February 17,	160	0	....	....	....	....	....	....
February 18,	60	0	14	0	36	0	....	....
February 18,	260	0	280	0	....	....	....	....
February 19,	350	0	20	0	12	0	....	....
February 19,	2400	0	24	0	....	....	....	....
February 20,	40	0	....	....	12	0	....	....
February 20,	16	0	....	....	10	0	....	....
February 21,	84	0	....	....	6	0	....	....
February 22,	4	0	....	....	40	2	....	....
February 22,	20	0	....	....	14	0	....	....
February 23,	10	0	....	....	36	0	....	....
February 23,	16	0	....	....	4	0	....	....
February 24,	10	0	....	....	....	....	....	....
February 24,	8	0	....	....	4	2	....	....
February 25,	4	0	....	....	2	0	....	....
February 25,	20	0	....	....	12	0	....	....
February 26,	30	0	....	....	14	0	....	....
February 26,	4	0	....	....	3	0	....	....
February 27,	6	0	....	....	16	0	....	....
February 27,	70	0	....	....	160	4	....	....
February 28,	120	0	....	....	250	0	....	....
February 28,	4	0	....	....	4	0	....	....
March 1,	8	0	....	....	6	0	....	....
March 1,	10	0	....	....	6	0	....	....
March 2,	20	0	....	....	20	0	....	....
March 2,	200	0	....	....	8	0	....	....

TABLE XX—Continued.

Date Collection.	Location of Sample.							
	Presque Isle.		Pumping Station.					
			M. H. on 60 in. supply main.		Worthington Pump Well.		Holly Pump Well.	
	Bacteria.		Bacteria.		Bacteria.		Bacteria.	
	Total.	B. Coli.	Total.	B. Coli.	Total.	B. Coli.	Total.	B. Coli.
March 3,	2	0	....	....	16	0	....	....
March 3,	140	0	....	....	12	0	....	....
March 4,	700	0	....	....	6	0	....	....
March 4,	1	0	....	....	20	0	....	....
March 5,	3	0	....	....	18	0	....	....
March 5,	4	0	....	....	40	0	....	....
March 6,	2	0	....	....	18	0	....	....
March 6,	14	0	....	....	84	0	....	....
March 7,	3	0	....	....	18	0	....	....
March 7,	8	0	....	....	10	0	....	....
March 8,	6	0	....	....	6	0	....	....
March 8,	6	0	....	....	24	0	6	0
March 9,	2	0	....	....	32	0	3	0
March 9,	10	0	....	....	36	0	84	2
March 10,	3	0	....	....	30	3	36	3
March 10,	4	0	....	....	3	0	8	0
March 11,	120	0	....	....	12	0	10	0
March 11,	12	0	....	....	3	0	8	0
March 12,	10	0	....	....	10	0	4	0
March 12,	6	0	....	....	16	0	4	0
March 13,	8	0	....	....	....	....	....	....
March 13,	20	0	....	....	14	0	2	0
March 14,	32	0	....	....	....	....	....	....
March 14,	12	0	....	....	1200	0	250	0
February 21,	10	0	....	....	....	....	....	....

The Lake water at the islands showed pollution in four out of 90 samples. At the manhole on the 60 inch intake just outside of the pumping station where, if any leaks in the steel pipe under the harbor, were occurring, the pollution would show there were sewage organisms present in six out of thirty-eight samples Usually the pollutions showed up in the manhole a day or so after the lake sample was found polluted. Six out of sixty-four of the Worthington pump well samples showed B. Coli and four out of sixteen samples at the Holly well. These sixteen samples, however, were collected at the time the Worthington well was bad.

On February 2nd, the Department had the brick conduit pumped out and an examination made to see if there were any leaks from the harbor that were polluting the Holly well. Such leaks were discovered but the water was found to be uncontaminated. The infiltered water had been purified in its lateral passage through a hundred feet or more of sand and gravel. In table XXI the results of these analyses are given:

TABLE XXI.

ANALYSES OF OLD BRICK CONDUIT WATER SAMPLES.

Date of collection.	Sample.	Bacteria.	
		Total.	B. Coli.
1911			
Feb. 2	Seepage from 36 in. pipe and Holly pump well,	1	0
Feb. 2	Seepage from 36 in. pipe and Holly pump well,	8	0
	Leak under well near end of conduit,	0	0
	Leak under well near end of conduit,	2	0

TABLE XII—Continued.

Date of collection.	Sample.	Bacteria.	
		Total.	B. Coli.
Feb. 8	Harbor water near end of wooden pipe, ...	100	8
	Harbor water near end of wooden pipe, ...	140	12
Feb. 23	Leakage that had filled old brick cond., ...	500	0
	Leakage that had filled old brick cond., ...	900	0
Feb. 25	Leakage that had filled old brick cond., ...	1,500	1
	Leakage that had filled old brick cond., ...	2,400	0
Feb. 28	Leakage that had filled old brick cond., ...	200	0
	Leakage that had filled old brick cond., ...	350	0
Mar. 2	Leakage that had filled old brick cond., ...	500	0
	Leakage that had filled old brick cond., ...	280	0

Had the sluice gate been opened at this time, sewage water from the harbor would have gradually found its way into the Holly pump well at not over the rate of one thousand gallons in 24 hours. However, there was no evidence of a bacteriological nature of the brick conduit having contained any but purified water. The sample showing one B. Coli was collected on the surface in the old Bull pump well where it could have been contaminated from the floor above.

6. No Leaks in 60 inch Supply Pipe Under Harbor.

The water in the pump wells must be at least 18 inches lower than the level of the lake water when 15,000,000 gallons each 24 hours is the rate of flow through the 60 inch steel pipe as this head is consumed in friction. The lake level is not constant and the rate of pumpage likewise varies. In table XXII is given the gage readings of the water levels at the pump well. For the months given in the table, the harbor level was higher than the lake level. This would increase the pressure on the 60 inch steel pipe. However, at no time is the equilibrum between the outward and inward pressures on the steel pipe disturbed to any material extent. It is substantially true that there is a slight inward pressure all the time. Hence any leaks developing along the line of this pipe would be almost sure to manifest themselves by means of the delicate bacteriological test of the water in the pipe. Throughout the year such tests made by the water board's chemist and by the State Department of Health failed to prove the existence of leaks in the steel main. Therefore, this source of origin of the typhoid outbreak is eliminated from consideration.

TABLE XXII.—RECORDED OBSERVATIONS OF WATER LEVELS IN WORTHINGTON PUMP WELL. ZERO IS U. S. MEAN LAKE LEVEL. READINGS ARE MINUS MEASUREMENTS IN FEET.

Day	November, 1910.		December, 1910.		January, 1911.		February, 1911.	
	7 A. M.	7 P. M.	7 A. M.	7 P. M.	7 A. M.	7 P. M.	7 A. M.	7 P. M.
1, ...	1.70	1.50	1.40	1.90	2.10	2.10	2.70	3.00
2, ...	.50	1.60	2.10	1.90	2.20	1.10	2.30	3.00
3, ...	1.90	1.90	2.05	1.70	1.90	2.15	3.00	3.00
4, ...	1.80	1.80	1.35	2.10	2.10	2.25	3.00	2.30
5, ...	1.60	1.60	2.20	2.50	1.10	2.65	2.10	1.30
6, ...	.90	1.00	2.20	2.20	2.50	2.10	2.00	1.00
7, ...	1.80	2.10	2.05	1.80	2.80	2.70	2.20	2.30
8, ...	1.40	1.10	2.00	1.70	2.40	1.60	2.10	2.20
9, ...	.40	....	2.00	2.00	1.20	2.35	2.60	3.00
10, ...	1.60	1.35	2.30	2.40	2.70	2.75	3.00	3.00
11, ...	.50	1.00	2.10	1.70	2.50	2.60	3.00	3.00
12, ...	1.20	1.10	1.70	2.10	2.50	2.30	1.80	2.50
13, ...	.90	1.80	2.10	1.60	2.40	2.20	2.30	3.00
14, ...	2.20	2.00	1.40	1.60	1.80	1.70	2.50	2.80
15, ...	1.90	2.00	1.40	1.40	1.80	1.50	2.70	3.00
16, ...	2.10	1.80	2.20	2.00	2.10	2.00	2.40	2.70
17, ...	2.00	2.40	2.20	2.30	2.30	2.40	3.00	2.60
18, ...	2.10	1.80	2.00	1.70	2.50	2.35	1.60	2.20

TABLE XXII—Continued.

	November, 1910.		December, 1910.		January, 1911.		February, 1911.	
	7 A. M.	7 P. M.	7 A. M.	7 P. M.	7 A. M.	7 P. M.	7 A. M.	7 P. M.
19, ...	2.10	2.20	1.40	1.70	2.00	2.90	1.40	2.10
20, ...	2.00	2.10	1.70	1.90	3.00	2.80	2.60	2.70
21, ...	1.90	1.60	2.00	1.90	2.30	2.85	2.70	3.00
22, ...	2.00	2.30	2.00	2.30	2.50	2.10	2.70	3.00
23, ...	2.20	1.80	2.50	2.30	2.50	2.25	3.00	2.80
24, ...	1.80	1.40	3.00	1.40	2.30	2.00	3.00	3.00
25, ...	1.50	2.00	2.05	1.70	2.30	2.30	3.00	3.00
26, ...	1.70	1.90	2.50	1.80	2.60	2.40	3.00	3.00
27, ...	1.60	2.20	2.15	2.20	2.40	2.25	3.00	3.00
28, ...	1.80	1.60	2.55	1.50	2.20	2.50	3.00	3.00
29, ...	1.40	1.20	2.05	2.60	2.30	1.70	....	....
30, ...	1.40	1.50	2.20	2.40	1.50	2.60	....	....
31, ...	....	....	2.50	2.70	2.60	2.60	....	....

7. Permanent Chemical Sterilizing Plant.

a. Plans for Chemical Treatment Plant Called For.

The Board of Water Commissioners employed three widely known experts to investigate the cause of the typhoid outbreak and to offer suggestions and advice to the Board. These experts made their report on February 4th, as follows:

"Erie, Feb. 4th, 1911.

"Commissioners of Water Works,
"Erie, Penna.

"Gentlemen:—

"At the beginning of our studies on the present critical typhoid condition in Erie, we found that your Board acting with the consent of the State Department of Health, had put in operation at the water station, a temporary emergency apparatus for introducing copper sulphate into the water supply. We are fully aware of the efficiency of copper sulphate for the removal of algae growths from waters and the diminution of bacteria present. Its use here was indicated since the materials were at hand and on account of the simplicity fo the installation of the necessary apparatus.

"We, however are severally of the opinion, that, under the existing circumstances, the use of hypo chlorite of lime is to be recommended. This compound when introduced into the water in minute quantities, is especially fatal to typhoid and other similar intestinal bacteria. We, therefore, recommend the immediate installation of a plant at the station for treating the water systematically with hypo chlorite of lime the same to be used until permanent works for the treatment of the supply shall have been installed.

"We recommend that you immediately retain some person conversant with the method of installation and operation of such a device and that the plant be operated under his personal direction, at least until the present serious conditions are abated.

"The methods for using the hypo chlorite of lime, are simple and would involve a very moderate outlay and by using it intelligently, the water supply of the city of Erie, will be protected from danger of typhoid fever and similar intestinal diseases.

"Yours respectfully,

"W. P. MASON,
"E. G. SMITH,
"F. F. WESTBROOK."

On the same day the Commissioners of Water Works handed over the report for the approval of the State Commissioner of Health:

"Erie, Pa., Feb. 4th, 1911.

"Samuel G. Dixon, M. D.,
"Commissioner—Department of Health,
"Harrisburg, Penna.

"Dear Sir:—

"The experts employed by this Board have handed in the joint letter, sent herewith, which we now forward you for your consideration and approval.

"Yours respectfully,

"WM. HAMILTON,
"FRANK D. SHULTZ,
"Commissioners of Water Works in the City of Erie."

On February 5th the Commissioner of Health made the following reply, calling for detailed plans for a permanent chemical sterilizing plant to be submitted at once and other plans for the more complete purification of the water to be submitted at a later date. The reply was as follows:

"Commissioners of Water Works,
"Erie, Pa.

"Gentlemen:—

"In answer to your communication, transmitting the recommendation of the Board of Experts, employed by you to investigate the typhoid situation in Erie, I beg to say that experts disagree as to the comparative merits of different chemical treatments of water. One expert will choose one method and another expert may advocate another method.

"The State Department of Health laboratory experts have, under my personal direction, worked out in practice the application of copper sulphate solutions and chlorinated lime solutions to public water works systems in Pennsylvania and I know that copper sulphate is efficacious in killing B. Coli in water.

"The chlorinated lime treatment is preferred and recommended by the Department where the constant services of a chemist are available and where the water must be constantly treated chemically for many months pending the erection of permanent purification works.

"Chlorinated lime is more difficult to apply, one-quarter to one-third of it is available for solution only, depending upon the quality of its manufacture; it rapidly deteriorates upon exposure and needs the constant attention of a chemist. Besides these objections to its common use by laymen in the operation of water works, are the further objections that the proper solutions of the lime are more difficult to secure and the administration of it in proper doses to the water is more difficult and requires more time for adjustment. In addition, chlorinated lime imparts a taste and odor to the water treated which in some instances renders the supply objectionable to the consumers. Altogether, the use of chlorinated lime is peculiarly an expert's job to install and operate, while the copper treatment is very simple and not open to any of the above objections.

"Within seven hours from the primary arrival of the Department officials in Erie on Saturday, January 28th, the local situation had been diagnosed, and with your consent, we had improvised simple apparatus and supervised and directed its setting up at the pumping station and copper sulphate solutions were being applied to the water supplied to the public in the city.

"We cannot continue indefinitely to supervise the treatment by a representative on the ground. Some chemical treatment must continue to be constantly applied until plans for permanent purification works have been devised by you and approved by the Commissioner of Health and until the works have been erected and put in commission. This will take many months at best. Meantime you should prepare and submit for approval, plans for the installation of more permanent apparatus than the improvised devices now in use at the pumping station.

"The recommendation of your Board of Experts, advising the hypo-chlorite of lime treatment, is in line with the recommendation that the Department makes to public and private corporations when its advice is sought, or is in line with the practice of the Department in its epidemical work in the field where the water must receive constant and continued chemical treatment as the months go by.

"The plans for the chemical treatment should be prepared by your experts and be submitted for approval at once. The installation of this plant should be under the direction of the expert who designs it, and the operation for the first few weeks at least should be under his responsible supervision.

"I suggest that you consider the advantages of installing the apparatus for the production of free chlorine by the application of electricity to ordinary salt, in preference to the installation of apparatus for the production of free chlorine by the application of bleach, since the former method is unattended by the odor and taste nuisance to which I have hereinbefore referred; more especially since the solution must be applied where the water goes directly into the distributing pipes of the city, thus affording no opportunity for a much desired period of contact.

"In conclusion, I wish to add that your efforts to establish permanent safeguards against the introduction of impure water to the public system in Erie, by the employment of experts to devise detailed plans, will undoubtedly be actively continued to the end that comprehensive plans, not only for a plant to chemically treat the water, but for a plant to permanently clarify and purify the water, shall be submitted for approval at the earliest practicable moment.

"The comprehensive plans for the chemical plant should be prepared within a few days. The comprehensive plans for the more extensive works should be forthcoming within three or four months.

"Yours very truly,
"SAMUEL G. DIXON,
Commissioner of Health."

b. Commissioner of Health's Permit.

The Water Board employed a chemist who had had had experience as an assistant in the treatment of water with chlorinated lime at the Chicago stock yards where this process was first exploited in America on a large scale. This expert's report on the Erie installation and the terms under which the Commissioner of Health permitted the plant to be built and operated were as follows:

"Erie, Penna., February 10, 1911.

"Samuel G. Dixon, M. D.,
"Commissioner, Department of Health,
"Harrisburg, Penna.

"Dear Sir:—

"I submit herewith, for your approval, the comprehensive plans for the permanent hypochlorite of lime or sodium treatment plant to be installed at the pumping station of the Erie Water Works. Detailed plans will follow within a few days.

"The treatment plant consists of a concrete mixing tank resting on I beams on top of two concrete solution tanks for storage. Each of the three tanks will be provided with a stirring device for agitation and a drain to the sewer for flushing out any accumulated solid matter.

"Feed pipes lead from the dissolving tank to the storage tanks. A centrifugal pump, with a duplicate for emergency, is provided to elevate the solution from the storage tanks to a head or orifice box above. The amount of solution fed is regulated by an adjustable orifice device in this head box and the excess solution pumped, returns to the storage tank in use through an overflow pipe in the head box. This not only gives additional mixing action to the solution in the storage tank but it also gives a constant head over the orifice in the head box. The solution fed by the orifice flows through a pipe to a grid or a set of grids placed in the 60 inch raw water main at the bottom of the 24 inch manhole some 100 feet north of the pumping station. A high pressure city water line is connected to this feed pipe below the head box to give a full flow through the feed pipe and a nozzle effect from the perforated pipes making up the grid. The header of the grid will be parallel to the longitudinal axis of the 60 inch main and the perforated pipes leading from the header, will reach to the bottom of the 60 inch main.

"Recording gauges will be provided to give a permanent record of the quantity of solution fed from the storage tanks during each hour of the day.

"These tanks will be enclosed in a building which will also provide storage room for the hypo-chlorite of lime drums or an electrolyzer to produce hypochlorite of sodium. A part of this building will be walled off and wil be used as a chemical and bacteriological laboratory. This building will be erected above the manhole above referred to.

"The plant is so designed that either a solution of hypochlorite of lime or a solution of hypochlorite of sodium produced electrolytically by the decomposition of salt, can be used equally well. I propose to put the plant into operation using hypochlorite of lime solution and to begin experiments myself if I remain here for a sufficient length of time and if not then to recommend in my report to the Water Commissioners of Erie, that experiments be begun forthwith on the electrolytic production of hypo-chlorite of sodium from salt. I favor the use of hypochlorite of lime at Erie at this particular time because it can be purchased in any quantity desired and is ready for immediate use and no time will be lost, whereas the production of hypochlorite of sodium has not yet been put on a commercial basis to my knowledge and I know of no cell that is on the market at this time, that will produce this in large quantities of a constant strength that is both economical and reliable, although I believe such a cell can be made.

"Respectfully submitted,
"C. A. JENNINGS."

"COMMONWEALTH OF PENNSYLVANIA
"DEPARTMENT OF HEALTH

"Harrisburg, Feb. 11th, 1911.

"To the Commissioners of Water Works,
"Erie, Penna.

"Gentlemen:—

"I hereby and herein approve the sketches entitled "Comprehensive Drawings of hypo-chlorite of lime treatment plant for Erie, Pa., Feb. 10th, 1911" and the written description thereof, bearing date of Feb. 10th, submitted for my consideration.

"I have determined that the proposed plant and treatment will not be prejudicial to public health if installed and operated under certain conditions and I approve the same and grant a permit therefor subject to the following conditions and stipulations.

"First—That the plant shall be erected and operated under the responsible supervision of the expert who designed it or under the supervision of some one equally competent.

"Second—The detailed plans of the plant as constructed shall be filed promptly in the office of the Commissioner of Health and records of its operation shall be kept daily on blank forms satisfactory to the Department and copies thereof shall be filed weekly in the office of the Commissioner of Health.

"Third—The chemical and bacteriological laboratory proposed shall be established and equipped and be constantly used and several analyses of the raw water and of the treated water shall be made daily.

"Fourth—The experimental tests for the production of free chlorine electrically by the decomposition of salt shall be instituted at once and shall be carried forward to a conclusion and a full report thereof shall be submitted to the Commissioner of Health for approval. It is desirable that this process be installed to eliminate odor and taste in the treated water, in preference to the use of bleaching powder, provided that the experiments show that it is applicable at the Erie Pumping Station.

"Fifth—The plant hereby approved shall be constructed at once and be maintained and operated and all of the water supplied to the public in Erie by the Municipal Water Works system shall be treated thereby until the Commissioners of Water Works have concluded studies and prepared plans for the clarification and purification of the water by more extended works and until such plans have been approved by the Commissioner of Health and the works have been built and put in operation. The plans for such works should be submitted not later than December 1st, 1911.

"Sixth—If at any time in the opinion of the Commissioner of Health, the water works or any part thereof or the water furnished thereby is prejudicial to public health, then such remedial measures shall be adopted forthwith as the Commissioner of Health may approve or advise.

"Seventh—Action on the application for approval of extensions to the water works system made since April 22nd, 1905, will, if satisfactory to the Commissioner, be postponed until the Board of Commissioners of Water Works of Erie has had time through its experts and its own deliberations to form conclusions as to a comprehensive scheme of improvements and extensions to the entire water works system covering a long period of years. This is not to be understood as a withholdment of approval of the intake and settling basins or other extensions, but to the contrary, these extensions will probably fit into and become a part of a comprehensive plan. Meantime a permit is granted to extend the water pipes in the streets of the city and at the close of each season plans of the pipes laid during the year, together with any other information relative thereto that may be required shall be filed in the office of the Commissioner of Health.

"SAMUEL G. DIXON,

"Commissioner of Health,
"Commonwealth of Pennsylvania."

"Erie, Penna., March 28, 1911.

"Samuel G. Dixon, M. D.,
"Commissioner Department of Health,
"Harrisburg, Pa.

"Dear Sir:—

"I submit herewith the plans of the permanent Hypochlorite of Lime or Sodium sterilizing plant for the water supply of the City of Erie, Pa., which I have completed and which was put into service at 8 A. M. March 15, 1911.

"Several changes have been made from the comprehensive plans which the writer submitted to you for approval in a letter under date of Feb. 10, 1911. These various changes were made to suit local conditions and all were deemed advisable for improving the operation of the plant.

"The sterilizing plant, as shown in the plans, is housed in a frame building located over the 24 inch manhole in the 60 inch raw water main about 100 feet north of the pumping station. This building contains a tank room 24 feet x 36 feet x 20 feet, a store room 24 feet x 12 feet x 10 feet and a chemical and bacteriological laboratory 24 feet x 15.5 feet x 10 feet. Globe ventilators are placed in the roof over the tank room to keep same free from odors arising when the Hypochlorite of Lime is dissolved.

"In the tank room are three reinforced concrete tanks, Tank "A" being the mixing or dissolving tank, Tank "B" and Tank "C" are for storing the diluted solution, the strength of which is about .5 per cent. Stirring devices operated by a 3.5 H. P. water motor have been installed.

"The feeding device to which the solution flows from Tanks "B" or "C", is the standard orifice box manufactured by the Pittsburg Filter Mfg. Co. The head of solution in this box is controlled by a 6 inch hard rubber float. There is a difference in elevation of about 34 inches between the outlets of Tanks "B" and "C" and the inlet to the orifice box and tests extending over a period of a number of days have proved that the float will give a constant head over the orifice irrespective of the head in the main solution tanks. As a result of this, a wonderfully accurate regulation in the application of the solution is possible. Two of these orifice boxes have been installed, it being deemed wise to hold one in reserve for emergency use in case of clogging, etc.

"The sterilizing solution is applied to the raw water in the 60 inch main below the 24 inch manhole above referred to. Two grids, each made up of ten one-half inch pipes capped at the end and each perforated with nine one-eighth inch holes, stand in the 60 inch main, the headers to which these pipes are connected being parallel to the longitudinal axis of the raw water main. Each of the two sets of pipes is 15 inches from the center of the main and these pipes stand vertically in it. The one-eighth inch holes face the outside and center of the raw water main. An 1½ inch city water line under 125 pounds pressure furnishes sufficient water to fill the pipes in the girds and to give a nozzle effect from each of the small holes. Tests have shown that an excellent mixing action takes place between the raw water and the solution. This point of application was chosen because of the location of the same. It is at a point in the raw water main before it is branched to go to the two pump suction wells and so it is unnecessary to make any change in the application of solution when a change is made in the pumps, except, of course, if the rate of pumping is changed, but this change is then made by changing the size of the orifice.

"A tap has been made in the 60 inch raw water main some 100 feet north of the sterilization plant for the collection of raw water samples which would show the condition of the water immediately before treatment.

"Tests have shown that using the quantity of solution that will be needed to produce a safe and pure water, the time period of action of the sterilizing solution is ample. There have been no tastes nor odors in the water treated with Hypochlorite of Lime.

"The initial dose has been reduced 33 per cent. since the plant was put into operation because of the fact that samples collected in different parts of the city showed the continued absence of B. Coli and very low bacterial counts on Gelatin. In all probablity it will be advisable to reduce the dose still further.

"Mr J. S. Dunwoody of Rensselaer Polytechnic Institute of Troy, N. Y., is now the Chemist and Bacteriologist in charge of the sterilization plant. He is thoroughly competent for this position and I have no hesitancy in saying that I am certain that under his supervision the operation of the plant will be perfectly satisfactory.

"The plant was designed by the writer with the idea of making it as nearly foolproof and automatic in operation as possible. I feel that I have succeeded in doing this.

"In closing I wish to say that I received hearty co-operation from the Water Works Commissioners in this work and that following their instructions I installed for this plant a laboratory with an excellent and complete equipment for bacteriological and chemical work and I feel certain that the results obtained by Mr. Dunwoody will be reliable.

"Respectfully submitted,

"C. A. JENNINGS,
"Hypochlorite of Lime Expert."

c. Analyses of Raw and Treated Water—Chlorinated Lime Process.

The Water Board has regularly filed reports of its laboratory operations. In Table XXIII will be found data relative to the turbidity of the Lake water and the proportion of chemical used to water supplied in the city up to and including April 20th. It was found that about 18 pounds of powder per million gallons of water pumped into the system would produce odor in the water and that 22 pounds would produce taste in the water.

TABLE XXIII.—CITY ANALYSES OF RAW AND TREATED WATER.

Beginning March 15th, when Chlorinated Lime was Applied.

1911.	Million gallons water treated.	Lime Used.		Parts per million available chlorine.	Turbidity.
		Powder.			
		Lbs. per 24 hrs.	Grains per gal.		
March.					
15,	14.0	112	.056	.385	18
16,	13.8	111	.054	.320	32
17,	13.6	117.5	.055	.330	16
18,	13.5	113	.058	.335	23
19,	13.2	113	.060	.350	15
20,	13.5	116	.060	.351	22
21,	13.2	105.7	.056	.385	20
22,	13.4	107.7	.056	.379	37
23,	14.1	100.8	.050	.375	48
24,	15.5	115.25	.051	.393	39
25,	15.8	115.5	.051	.419	21
26,	13.9	102	.051	.340	33
27,	14.2	96.8	.048	.304	30
28,	14.5	91.8	.044	.266	61
29,	13.8	102.3	.052	.305	43
30,	13.0	96.5	.052	.281	46
31,	12.7	88.7	.048	.301	62
April.					
1,	13.4	93.25	.048	.284	68
2,	11.8	87.70	.052	.305	85
3,	12.9	101.3	.055	.322	48
4,	13.8	102.3	.052	.394	42
5,	13.4	99.0	.051	.304	44
6,	13.6	102.6	.053	.310	38
7,	12.8	96.25	.053	.305	42
8,	14.0	102	.050	.290	34
9,	12.3	90.6	.051	.308	29
10,	13.8	97.7	.050	.292	27
11,	13.9	98	.049	.314	18
12,	13.7	86.7	.044	.288	31
13,	14.0	93.25	.046	.295	20
14,	12.4	90	.050	.317	16
15,	12.4	84.5	.047	.298	31
16,	12.5	95.8	.053	.335	....
17,	13.9	96.8	.048	.305	33
18,	12.9	88.7	.048	.301	14
19,	13.1	97.4	.052	.326	20
20,	12.8	92.25	.050	.313	26

There also follow in Table XXIV chemical analyses of the raw and treated water. The Park Pump is about 200 feet distant from the Laboratory where the chlorinated lime solution is applied to the 60 inch steel main at the manhole. This pump was installed to enable samples of raw water from said main to be obtained prior to the chemical treatment, after the water has passed under the Harbor. The house at 608 Chestnut Street draws its water off the force main from the pumping station.

TABLE XXIV.—CITY CHEMICAL ANALYSES OF WATER, RAW AND TREATED.

	Raw water.		Treated Water.		
	April 13.	April 13.	Mar. 23.	April 13.	April 13.
	Peninsula.	Park pump.	Lab. tap.	Worth well.	608 Chestnut St.
Taste,	None.	None.	None.	None.	None.
Odor,	None.	None.	None.	None.	None.
Color, (parts per mil.),	20	20	10	10	10
Turbidity,	20	20	48	22	16
Nitrites,	Trace.	Trace.	Trace.	Trace.	Trace.
Nitrates,	0.10	0.12	0.10	0.10	0.10
Chlorine,	10.00	10.00	10.00	10.00	9.50
O. Consumed,	2.60	2.50	2.52	2.20	2.20
Alkalinity, $CaCO_3$,	100.00	102.50	100.00	102.50	100.00

Bacteriological analyses of raw and treated water made by the city are given in Table XXV.

TABLE XXV.—CITY BACTERIOLOGICAL ANALYSES OF RAW AND TREATED WATER.

Date, 1911.	Raw Water.				Treated Water.	
	Peninsula.		Park Pump.		Taps about Town.	
	Total.	B. Coli	Total.	B. Coli	Total.	B. Coli
March.						
15,	1,260	0			7	0
15,					315	0
16,	1,208	0				0
16,						0
17,	1,068	0				
18,	720	0			11	0
18,					12	0
19,	400	0			10	0
19,					10	0
20,	154	0			7	0
20,					8	0
21,	144	0			4	0
21,					8	0
21,					3	0
22,	328	0	396	Present	10	0
22,					9	0
23,	330	0	254	0	2	0
23,					8	0
23,					7	0
24,	68	0	76	0	4	0
24,					0	0
25,	78	0	66	0	6	0
25,					12	0
25,					0	0

TABLE XXV.—CITY BACTERIOLOGICAL ANALYSIS OF RAW AND TREATED WATER—Continued.

Date, 1911.	Raw Water.				Treated Water.	
	Peninsula.		Park Pump.		Taps about Town.	
	Total.	B. Coli	Total.	B. Coli	Total.	B. Coli
26,	114	0	106	0	3	0
26,	....	....	....	....	2	0
27,	218	0	216	0	0	0
27,	....	....	....	....	3	0
27,	....	....	....	....	0	0
28,	170	0	....	0	3	0
28,	....	....	....	....	1	0
28,	....	....	....	....	3	0
29,	130	0	132	Present	2	0
29,	....	....	....	....	4	0
29,	....	....	....	....	7	0
30,	250	Present	258	0	2	0
30,	....	....	....	....	2	0
30,	....	....	....	....	3	0
31,	312	0	290	0	2	0
31,	....	....	....	....	1	0
31,	....	....	....	....	1	0
April.						
1,	320	0	364	0	2	0
1,	....	....	....	....	14	0
1,	....	....	....	....	2	0
2,	620	Present	....	....	2	0
3,	118	0	100	0	2	0
3,	....	....	....	....	3	0
3,	....	....	....	....	2	0
4,	....	....	147	Present	1	0
4,	....	....	....	....	1	0
4,	....	....	....	....	6	0
5,	252	0	238	Present	6	0
5,	....	....	....	....	27	0
5,	....	....	....	....	0	0
6,	106	0	109	0	1	0
6,	....	....	....	....	2	0
6,	....	....	....	....	2	0
7,	204	0	190	0	3	0
7,	....	....	....	....	1	0
7,	....	....	....	....	3	0
8,	228	Present	204	0	4	0
8,	....	....	....	....	2	0
8,	....	....	....	....	24	0
9,	114	0	104	Present	49	0
10,	96	0	84	0	8	0
10,	....	....	....	....	6	0
11,	124	0	148	0	16	0
11,	....	....	....	....	5	0
11,	....	....	....	....	18	0
12,	....	....	164	0	5	0
12,	....	....	....	....	12	0
13,	200	0	168	Present	8	0
14,	426	0	400	0	14	0
14,	....	....	....	....	30	0
15,	140	0	144	0	9	0
15,	....	....	....	....	18	0
15,	....	....	....	....	21	0
17,	86	....	97	....	8	....
17,	....	....	....	....	11	....
17,	....	....	....	....	10	....
18,	108	....	117	....	7	....
18,	....	....	....	....	8	....
18,	....	....	....	....	8	....
19,	114	....	125	....	5	....
19,	....	....	....	....	7	....
19,	....	....	....	....	13	....
20,	160	....	170	....	9	....
20,	....	....	....	....	6	....
20,	....	....	....	....	15	....

It will be noted in Table XXV that sewage organisms were present in the raw water on nine different days. The relation of the wind to B. Coli in the raw water is shown in Table XXVI.

TABLE XXVI. RELATION OF WIND TO B. COLI IN RAW WATER. CITY ANALYSES.

Date, 1911.	Direction of Wind.	B. Coli.	Remarks.
March.			
15,	N. W.		
16,	W.		
17,	S.		
18,	W.		
19,	S.		
20,	W.		
21,	W.		
22,	S. W.	Present,	
23,	N. W.		
24,	N.		
25,	S.		
26,	S.		
27,	S.		
28,	W.		
29,	N. E.	Present,	Strong Wind.
30,	W.	Present,	
31,	W.		
April.			
1,	N. W.		
2,	W.	Present,	
3,	N. E.		Strong Wind.
4,	S. E.	Present,	
5,	S. W.	Present,	
6,	S.		
7,	W.		
8,	N. E.	Present,	Strong Wind.
9,	N.	Present,	
10,	S. W.		
11,	S. E.		
12,	S. E.		Water fell ½ foot in harbor.
13,	S.	Present,	
14,	W.		
15,	W.		
16,	W.		
17,	W.		
18,	S.		
19,	N. E.		Strong Wind.
20,	N. E.		

d.—Efficacy of the Chemical Treatments.

Typhoid fever cases continuing to be reported in large numbers daily after the date fixed by the State Department of Health for the substantial decline of the epidemic afforded an opportunity which was embraced by a few persons to criticise the said Department on the score that chlorinated lime should have been used from the outset. These few critics, however, entirely overlooked the fact that the doctors were several weeks behind in reporting the cases and that many onsets belong back in January or the early part of February. This fact is brought out graphically in Chart No. 3. From this it will be seen at a glance that few cases were reported for December, although many occurred then; and that for January, although increasing numbers of cases were reported, a great many more occurred that were not reported until well over into the month of February; and that for the last half of February cases actually occurring dropped off rapidly as predicted, although the reporting of cases had to continue to make up the list canvassed by the Department.

There was nothing to indicate in the data collected in either the city laboratory or the State Department of Health laboratory that the water treated by the copper sulphate and the water treated by the chlorinated lime were not equally pure and wholesome. The particular reasons for using the copper sulphate were hereinbefore stated.

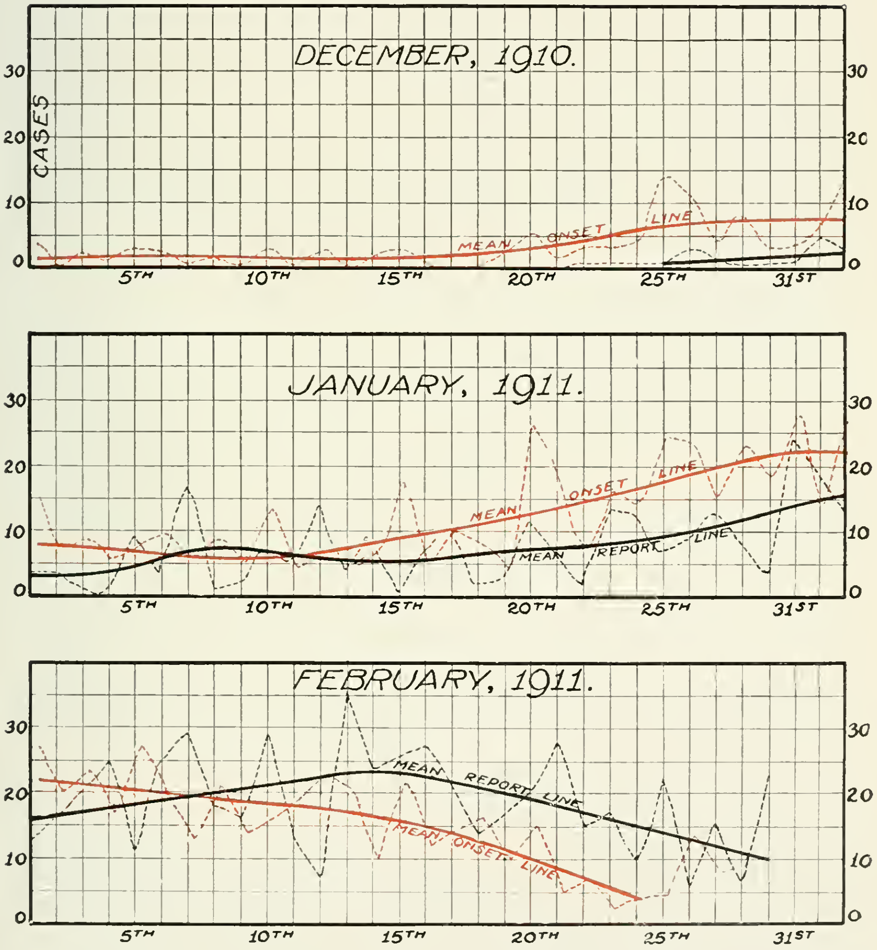
8. PERMANENT PURIFICATION WORKS.

a. Work Under Way Not Approved by State. Dispatch Inquiry.

The Erie Dispatch, a newspaper published daily, in order to ascertain the truth from an official source relative to whether the plans for the $375,000 improvement to the city water works system had been sanctioned by the State

(CHART No 3)

ERIE TYPHOID FEVER CHART.



Health authorities, sent a telegram, embodying nine pertinent queries, to Dr. Samuel G. Dixon, State Health Commissioner. The list of questions and the answers follow below:

No. 1—Has the State Health Department authority under the law establishing the Department to require the water commissioners of Erie to obtain official approval before awarding contracts on extensions of work affecting the water works system?

Answer. The law of April 22nd, 1905, provides that before any water works system or part thereof can be extended, a permit therefor must be issued by the Commissioner of Health. The question of awarding contracts by a municipality is not directly set forth in this law. It is naturally taken for granted that no municipality, therefore, will award a contract for the extension of its water works system until a permit has been granted.

No. 2—What, if any, permission has ever been granted the water commissioners of Erie to lay an intake pipe one mile or more into Lake Erie, and to proceed with the construction of settling or sedimentation basins on the Presque Isle peninsula? We have searched the court house records and have found no such permission on the books.

Answer. No permit issued by State Department of Health, but see Act of Congress 1893.

No. 3—Have the water commissioners of Erie been authorized to proceed and award contracts for the permanent improvement of such settling basins, at an expense from $80,000 to $200,000, without the approval of the State Health Department?

Answer. This matter has not come up before the State Department of Health.

No. 4—Could they, the water commissioners, do such work without your official permission and obtain your permission afterwards by proving through experts that the work is for the best interest of the public of the city of Erie?

Answer. Every case that comes before the State Department of Health is decided upon its own merits for the interests of the public health.

No. 5—In case you have never given such consent, would you recognize a protest from the councils or citizens of Erie against the carrying out of such contract until after the State Health Department has inspected and passed upon the plans?

Answer. We are always willing to grant a public hearing before any decision is reached in reference to permits.

No. 6—Could the water commissioners be stopped by applying to you, or should a protest be made in the courts?

Answer. Refer to city solicitor.

No. 7—Has Water Commissioner Clark Olds applied personally, or by letter, within the past day or two, to your Department for approval of work that has been done by the water commissioners of Erie?

Answer. No.

No. 8—Have you ever had an inspection made of the water works system of Erie by men authorized to make official reports to you? If so, when and how far were such works followed out and by whom?

Answer. See Chief Engineer Snow, now in Erie.

No. 9—What is the present status of the water department of Erie in your Department records so far as having, or not having, official approval for the water works system that has been built here?

Answer. No official permit has been granted for extensions of the water works system.

These questions and answers were published in the Dispatch of February 4th. On February 6th the following application for approval of the water works system was made by the Board of Commissioners.

b.—Application for Approval of Work in Progress.

"Erie, Penna., Feb. 6, 1911.

"Hon. Samuel G. Dixon, M. D.,
"Commissioner of Health,
"Harrisburg, Penna.

"Dear Sir:—

"We, the undersigned Commissioners of Water Works in the City of Erie respectfully state that all location of pipes, the building of the extension into Lake Erie, the erection of sedimentation basins on the peninsula and the extending of water mains into Millcreek Township, were made under the supposition that we had power so to do and without any intention of evading the provisions of the act of April 22nd, 1905.

"Had we been aware of said act, we would, as a matter of course, have made our application for permission to do said referred to work and to make said extensions in the City of Erie and in Millcreek Township, and therefore, we respectfully ask you to consider our plans, which we herewith again submit to you and if you find that they are legal and proper, will ask that you approve the same and also authorize us to make any further extensions which we may deem for the best interests of the people of the City of Erie and Millcreek Township.

"Yours respectfully,

"WM. HAMILTON,
"FRANK D. SHULTZ,
"Commissioners of Water Works in the City of Erie."

c. Correspondence Between Commissioner of Health and City Solicitor.

On March 13th City Councils resolved to institute proceedings against the water commissioners. Whereupon there followed correspondence between the city solicitor and the Commissioner of Health, all of which is given below:

"Erie, Pa., March 18, 1911.

"Honorable Samuel G. Dixon,
"Commissioner of Health,
"Harrisburg, Penna.

"Dear Sir:—

"Your Department is probably fully aware of the legal status of the water department of the City of Erie. It is operated, managed and controlled exclusively by three commissioners appointed by the Court of Common Pleas of Erie County, under the provisions of a special Act passed in 1867.

"In the year 1905 a vigorous fight was made by the sinking fund commissioners of the City of Erie, in an equity proceeding in court, to abolish the commission and place the entire management and control of the department in the hands of councils and Mayor. In that case, it was held that the city having furnished the money through an issue of bonds, to construct the works, was the owner of the property, although the management was under the absolute control of the commissioners named by the court.

"In that proceeding an attempt was made to enjoin the construction of an intake pipe into the lake as it now exists, as well as the construction of sedimentation basins on the peninsula. The contract for the extension of the pipe was let in July, 1904, nine months prior to the approval of the Act under which your department controls the appropriation of water supply by municipalities and water companies.

"I take it that you have full personal knowledge of the conditions which have existed here for some months, as well as the avowed intention of the water department to proceed with the construction of the sedimentation beds referred to.

"On the 13th inst., councils passed a resolution directing me to institute proceedings on behalf of the city, to enjoin the commissioners of water works from further proceeding with the construction of the sedimentation beds until a proper permit therefor had been obtained from your department and until the commissioners of water works had established conclusively the expediency of the improvement referred to. This resolution was approved by the Mayor on the 17th inst. The matter is now up to me for consideration. I would like very much for you to advise me:

"First: Whether application has been made to your department by the commissioners for permission or for the approval of their plans for the construction of the sedimentation beds referred to and, if not, if you deem it the duty of the commissioners of water works to submit their plans to your department for approval before proceeding with the work.

"Second: Will you and your engineers support me by testimony in a contention that the proposed expenditure for sedimentation beds is inexpedient and useless expenditure of public money?

"Undoubtedly the commissioners of water works have a certain discretion and I should be compelled to supply strong proof that the expenditure proposed would be wasteful and unwarranted. If I can sustain this contention by the clear preponderance of testimony, the court will undoubtedly enjoin the further progress of the work, and I wish to state frankly that I do not care to make an attack upon the water commissioners unless I can be clearly and forcefully sustained by your department.

"I will take no action until I can hear from you.

"Yours very truly,

"CHAS. P. HEWES,
"City Solicitor."

"March 21st, 1911.

"Charles P. Hewes, Esq.,
"City Solicitor,
"Erie, Penna.

"Dear Sir:—

"In answer to your esteemed favor of the 18th inst., I beg to say that on February 6th, 1911, the Commissioners of Water Works of the city of Erie made application for approval of their water works system, including all additions and extensions made since April 22nd, 1905, and including any further extensions which they might deem for the best interests of the people of Erie. This application included consideration of the sedimentation basins on the peninsula. On February 11th, 1911, I replied as follows:

"'I hereby and herein approve the sketches entitled 'Comprehensive Drawings of hypo-chlorite of lime treatment plant for Erie, Pa., Feb. 10th, 1911' and the written description thereof, bearing date of Feb. 10th, submitted for my consideration.

"'I have determined that the proposed plant and treatment will not be prejudicial to public health if installed and operated under certain conditions and I approve the same and grant a permit therefor subject to the following conditions and stipulations.

"'First: That the plant shall be erected and operated under the responsible supervision of the expert who designed it or under the supervision of some one equally competent.

"'Second: The detailed plans of the plant as constructed shall be filed promptly in the office of the Commissioner of Health and records of its operation shall be kept daily on blank forms satisfactory to the Department and copies thereof shall be filed weekly in the office of the Commissioner of Health.

"'Third: The chemical and bacteriological laboratory proposed shall be established and equipped and be constantly used and several analyses of the raw water and of the treated water shall be made daily.

"'Fourth: The experimental tests for the production of free chlorine electrically by the decomposition of salt shall be instituted at once and shall be carried forward to a conclusion and a full report thereof shall be submitted to the Commissioner of Health for approval. It is desirable that this process be installed to eliminate odor and taste in the treated water, in preference to the use of bleaching powder, provided that the experiments show that it is applicable at the Erie pumping station.

"'Fifth: The plant hereby approved shall be constructed at once and be maintained and operated and all of the water supplied to the public in Erie by the municipal water works system shall be treated thereby until the Commissioners of water works have concluded studies and prepared plans for the clarification and purification of the water by more extended works and until such plans have been approved by the Commissioner of Health and the works have been built and put in operation. The plans for such works should be submitted not later than December 1st, 1911.

"'Sixth: If at any time in the opinion of the Commissioner of Health, the water works or any part thereof or the water furnished thereby is prejudicial to public health, then such remedial measures shall be adopted forthwith as the Commissioner of Health may approve or advise.

"'Seventh: Action on the application for approval of extensions to the water works system made since April 22nd, 1905, will, if satisfactory to the Commissioners, be postponed until the Board of Commissioners of Water Works of Erie has had time through its experts and its own deliberations to form conclusions as to a comprehensive scheme of improvements and extensions to the entire water works system covering a long period of years. This is not to be understood as a withholdment of approval of the intakes and settling basins or other extensions, but to the contrary, these extensions will probably fit into and become a part of a comprehensive plan. Meantime, a permit is granted to extend the water pipes in the streets of the city and at the close of each season, plans of the pipes laid during the year together with any other information relative thereto that may be required shall be filed in the office of the Commissioner of Health.'

"On February 5th, 1911, I wrote to the Commissioner of Water Works, and among other things, I stated:

"'In conclusion, I wish to add that your efforts to establish permanent safeguards against the introduction of impure water to the public system in Erie, by the employment of experts to devise detailed plans will undoubtedly be actively continued to the end that comprehensive plans, not only for a plant to chemically treat the water, but for a plant to permanently clarify and purify the water, shall be submitted for approval at the earliest practicable moment.

"'The comprehensive plans for the chemical plant should be prepared within a few days. The comprehensive plans for the more extensive works should be forthcoming within three or four months.'

"Under these circumstances and because the Department withheld its approval of the sedimentation basins, the Water Commissioners should have carried out the suggestions offered by the Department and have set experts to work at once on the comprehensive plans. These plans might have been ready for consideration by this time, and provided the experts found that the sedimentation basins were an economical and essential part of the comprehensive improvements, then the plans could have been submitted to the Department for approval and if approved, a permit could have been issued to the Water Commissioners and no delay would have been occasioned the contractor who is now engaged in completing the concrete lining of the first settling basin.

"To say the least, it would have been prudent for the Water Commissioner to have completed the studies above referred to before going on with this work, and in our opinion, it was against public policy and the law for the Water Commissioners to have proceeded to expend money on the basins before comprehensive plans had been prepared and it had been determined whether the work in progress would be an essential and economical feature of said comprehensive plans.

"I am writing this day to the Water Board for a full set of plans and specifications and copies of contract for the sedimentation basins, and also for a statement as to the Water Commissioners' purpose in going on with this work and to what extent they intend to carry on the work. I will then promptly communicate further with you on the subject.

"Trusting this reply will be satisfactory, I am,

"Yours very truly,

"SAMUEL G. DIXON,
"Commissioner of Health."

"March 21st, 1911.

"Board of Water Commissioners,
"City of Erie,
"William Hamilton, President,
"Erie, Penna.

"Gentlemen:—

"I wish to obtain from you a written statement as to your intention in proceeding with the work at the sedimentation basins. Please send a full set of plans of both basins and a copy of the contract and specifications and bids under which you are now proceeding to complete the first basin.

"I should also like to know whehter you intend to proceed with the improvements at the second basin and also whether you have employed an expert to carry out suggestions contained in the Department's communications to you Feb. 6th and 11th, 1911.

"Yours very truly,

"SAMUEL G. DIXON,
"Commissioner of Health."

"Erie, Penna., April 3, 1911.

"Dr. Samuel G. Dixon,
"Commissioner of Health,
"Harrisburg, Penna.

"Dear Sir:—

"Yours of the 21st ult. addressed to the Board of Water Commissioners, William Hamilton, President, was placed before the Board of Water Commissioners at a meeting last Saturday and I was directed to explain the cause of the delay in not giving the information desired earlier, but as your letter was addressed to Mr. Hamilton, same was delivered to his place of business, and Mr. Hamilton being in the south at the time, only returning during the past week did not receive same until his return. I am directed by the Commissioners to comply with your request to send plans of both basins as well as a copy of the specifications and proposal under which this work was awarded to the T. A. Gillepsie Company of Pittsburg and New York. The Commissioners have not prepared any detailed plans for basin No. 2 as they have no intention of cementing this basin in the near future but we are sending under separate cover detailed plans for cementing basin No. 1. The Commissioners have not employed an expert as they have not laid out any work for which an expert would be necessary aside from concreting this basin No. 1.

"Trusting that we have given you the information as requested in your letter of March 21st, we beg to remain,

"Yours very truly,

"GEORGE C. GENSHEIMER,
"Secy.

"Erie, Pa., April 6, 1911.

"Honorable Samuel G. Dixon,
"Commissioner of Health,
"Harrisburg, Pennsylvania.

"Dear Sir:—
"Can you give me any further information as to the probability of your approval of the plans of the Commissioners of Water Works in the City of Erie, for the construction of sedimentation basins upon the Peninsula of Presque Isle?

"Regret to have to trouble you, but I must dispose of the matter in some way.

"Very truly yours,

"CHAS P. HEWES,
"City Solicitor."

"Erie, Penna., April 24, 1911.

"Dr. Samuel G. Dixon,
"Commissioner of Health,
"Harrisburg, Penna.

"Dear Sir:—
"In further reference to your communication of March 21st addressed to the Board of Water Commissioners, William Hamilton, President, and the Commissioners reply to same under date of April 3rd, 1911, beg to say that at a special meeting of the Commissioners held this day, the following resolution was offered by Mr. Olds and passed by the votes of Mr. Olds and Mr. Schultz—Mr. Hamilton, Chairman of the Board not being present at this meeting. to wit:

"Resolved: 'That the Department employ an expert or experts as soon as practical to go over the whole plant and make a report with a view to carrying out the recommendations of the State Board of Health relative to the improvement of our water supply.'

And beg to remain

Yours very truly,

"GEORGE C. GENSHEIMER,
"Secy."

"April 27th, 1911.

"Hon. Charles P. Hewes,
"City Solicitor,
"Erie, Pa.

"Dear Sir:—
"In further answer to your recent inquiry as to the probability of this Department's approval of the plans of the Commissioners of Water Works in the city of Erie, for the construction of sedimentation basins upon the peninsula of Presque Isle, I beg to say that the said commissioners have authorized the employment of an expert or experts to go over the whole plant and make a report with a view of carrying out the recommendations of the Commissioner of Health relative to the improvement of the water supply, so that in conformity with the decree issued by me to said Commissioners, I am bound to withhold action on the sedimentation basins until the comprehensive plans of the experts are laid before me for consideration. We shall then either modify, amend or approve the plans.

"Yours truly,

"SAMUEL G. DIXON,
"Commissioner of Health."

d. Employment of Engineer to Make Comprehensive Iprovement Plans.

Early in July the Commissioners of Water Works employed Chester and Fleming of Pittsburgh to make preliminary plans and estimates for the water works improvement and on November 2nd said engineers were engaged to prepare final plans and specifications for a new pump house, filter plant, low pressure pumps and a standpipe. The following correspondence is relevant to these matters:

"Erie, Penna., July 11, 1911.

"Dr. Samuel G. Dixon, Commissioner of Health,
"Harrisburg, Pennsylvania.

"Dear Sir:—

"By direction of the Commissioners, I beg to advise that they engaged the services of Messrs. Chester & Fleming of Pittsburg to prepare preliminary plans and estimates for the Water Works improvement in this city. This means the making of estimates and recommendations for a new pump, a new pump house or the reconstruction of our present pump house, new boilers, the remodeling of our present boiler house and a filter plant. The gentlemen mentioned have taken up the work and are gathering data from which to prepare such plans and estimates and expect to make a report to the Commissioners in from two to four weeks and beg to remain "Yours very truly,

"GEORGE C. GENSHEIMER,
"Secy."

"Erie, Penna., August 22, 1911.

"Dr. Samuel G. Dixon,
"Commissioner of Health,
"Harrisburg, Penna.

"Dear Sir:—

"In reply to yours of the 17th inst. in which you ask if the Commissioners cannot give you the least kind of a suggestion about when the plans for water works improvements will be sent to Harrisburg, will say that within two weeks the Commissioners have received from Chester and Fleming of Pittsburgh preliminary plans and estimates for improvements including filter system. These plans and recommendations are now in the hands of Mr. Hamilton, President of the Board, and upon his return to the city which will be about the first of September, the recommendations made by Mr. Chester will be either approved or rejected. The Commissioners hope to bring this matter to an issue at an early date but it is not likely that it will be earlier than the fore part of September.

"I believe we explained in our former letter that Messrs. Chester and Fleming were engaged merely to prepare preliminary plans and estimates but they have not been engaged for the final work after the Commissioners have decided what is best for the Water Works improvement in this city. They will be guided, however, by the best recommendations available and will leave nothing undone to improve the water system in Erie and will no doubt call upon your department for advice before the work is begun and beg to remain

"Yours very truly,

"GEORGE C. GENSHEIMER,
"Secy."

"Erie, Penna., November 14, 1911.

"Dr. Samuel G. Dixon,
"Commissioner of Health,
"Harrisburgh, Penna.

"Dear Sir:—

"We are mailing you today under separate cover, a copy of the Commissioners' specifications for a twenty million gallon pumping engine. These specifications were prepared by Chester & Fleming of Pittsburgh, Penna., and I am also directed by the Commissioners to advise you that on November 2nd, the following resolution was passed by the Board and made a matter of record, which reads:

" 'Resolved: That Messrs. Chester & Fleming be authorized and directed to prepare plans and specifications for a new pump house, filter plant, low pressure pumps and a standpipe.'

This follows in line with the improvements which the Commissioners have had in view during the past years and beg to remain

"Yours very truly,

"GEORGE C. GENSHEIMER,
"Secy."

9. RESPONSIBILITY RESPECTING THE PUBLIC WATER SUPPLY IN ERIE.

Prior to 1905 the people of the Commonwealth of Pennsylvania had no executive department of government charged with the responsibility of regulating and controlling the purity of the public water supplies; but in that year the General Assembly by statute provided that the State Department of Health should have authority over all water works systems and sewer systems for the protection of the public health. A Commissioner was appointed and clothed with ample power to administer the affairs of the Department and to remove all causes of disease and mortality. As has been hereinbefore shown, in the discharge of his duties the Commissioner had taken action with respect to both the water works and sewer systems of Erie prior to the epidemic of 1910 and 1911. The Board of Water Commissioners failed to observe the law mentioned in some respects and it did not realize until after the Commissioner took charge of the Erie situation, to what extent the Department was equipped to handle an epidemic and to force compliance with its orders.

The work of the Department in temporarily treating the water with a germicide, using copper sulphate for the purpose, was followed by the substitution of a permanent germicidal plant and the treatment of the water with chlorinated lime. The young chemist who devised the plans for this permanent plant and who built the works in conformity therewith and supervised the operation for a short time thereafter, was an ardent adherent and advocate of this particular process. In a report which he subsequently prepared and published in an engineering journal, treating of the typhoid fever epidemic in Erie, he attempted, or it was understood that he attempted, to make it appear by comparison of results obtained, that the calcium hypo-chlorite treatment was efficient and the copper sulphate treatment was not efficient. His tables were not based on reliable, relevant data and he published his report without consultation with the State authorities in charge. He paid no attention to onsets of cases, but took the cases by dates reported to the city Board of Health, which were misleading. Furthermore, he neglected to mention that, with the four exceptions noted, not a single sample of the water treated with copper sulphate showed the presence of B. Coli. However, there were similar exceptions in samples collected from taps about town of water treated with calcium hypo-chlorite. In both instances, this was attributed, not to the inefficiency of the treatment, but to the stirring up of sediment in the service pipes of the city. The better comparative statement would have been that in not a single sample collected at the pumping station, (immediately after the raw water was treated), were B. Coli found under either process of treatment. The onset of cases dropped down within the 20 day period as predicted by the Department and not as shown or indicated to the reader who might study the said chemist's chart, which deals with cases reported but not the onsets.

The calcium hypo-chlorite treatment was applied at the tail end of the epidemic. The force of the outbreak had been expended and the low number of cases after the lime treatment was started would have occurred if the copper sulphate treatment had been continued, judging from all the evidence at hand and also in the opinion of the Department. This statement is made not to depreciate in any way the value of the chlorinated lime process, but in emphasis of the fact that the Commissioner of Health assumed the responsibility for the treatment of the water by both processes and he did so with a full understanding and appreciation of all the circumstances attending the epidemic.

There is no other ready means at hand in Pennsylvania to compel the owners or managers of public water works systems to deliver to the consumers a high degree of pure and wholesome water than that afforded by the State Department of Health. A Water Board or a water company may believe sincerely that the water furnished to the public is reasonably pure and wholesome. If now and then contaminated water passes through the system into the homes of the users and causes sickness and death, it is almost impossible, in the practice of law and under the rules of evidence, to prove in a legal sense that the water is the means of transmitting the specific germs that cause the sickness and death. A human being may be hanged on circumstantial evidence, but a water company may not be convicted on such evidence, even for wholesale slaughter. So, in the wisdom of the Legislature, it has been deemed good public policy to provide a State Department equipped with all facilities for accurate knowledge as to what is prejudicial to public health in the matter of supplying people with drinking water and to give this Department ample power to compel compliance with orders for the protection of the public health. At Erie, according to what has been agreed and determined by the State Health authorities, nothing short of a filtration plant is a sufficient safeguard, and it is because of this determination and decree by the Commissioner of Health that the city of Erie is soon to have a modern water purification plant.

10. GENERAL PRECAUTIONS TAKEN AT ERIE.

a. With Respect to Water and Ice.

With respect to water, the following warning was issued to the public on January 28th:

WARNING.

STATE DEPARTMENT OF HEALTH

Harrisburg, Pa., January 28, 1911.

To the Public in Erie:

During the month of January there have been twenty-four deaths from typhoid fever in Erie City and 185 cases of the disease. This is certainly an alarming condition.

The State Department of Health will undertake an exhaustive investigation to ascertain the origin of the fever outbreak and to assist in stamping out the disease.

The Erie Board of Water Commissioners will install apparatus at the pumping station to treat the water chemically and destroy micro-organic life. This treatment will be in use within the next twenty-four hours and other precautionary measures will follow. However, it is absolutely essential that the public continue to boil all water used for drinking and culinary purposes.

I am convinced that the public notices to this effect issued by the Erie City Board of Health have not been universally heeded. I hereby warn the citizens of Erie, the hotel, boarding house and restaurant and other proprietors and users of public water that the interests of public health demand that all water to be used for domestic purposes shall be raised to the boiling point and be maintained at the boiling point for at least twenty minutes.

SAMUEL G. DIXON,
Commissioner of Health.

On February 2nd the following warning relative to the use of milk and ice was issued by the Commissioner of Health:

COMMONWEALTH OF PENNSYLVANIA

DEPARTMENT OF HEALTH

Harrisburg, Pa., February 2, 1911.

WARNING TO THE PUBLIC OF ERIE.

No ice harvested from Erie harbor should be used in milk or water, or be brought in contact with raw vegetables, or food of any character.

It is safer for the present to boil all milk to obviate any possible contamination by water or otherwise. Attention to these matters may save sickness, suffering and possible death. Do not fail to boil the water for twenty minutes.

SAMUEL G. DIXON,
Commissioner of Health.

After the street mains had been thoroughly flushed out, the Water Board notified all consumers, both by postal card and in the columns of the local newspapers, to open their service taps and other water fixtures and thus flush out all dead water from the house connections. The notice sent out by the Board was as follows:

Notice to Water Takers.

At the request of Dr. Samuel G. Dixon, Commissioner of Health, all water takers are asked to open all the water faucets full force on their premises, in order to flush out the service pipes. Therefore, the Commissioners of Water Works asked that the request be complied with and that the water be allowed to run about 15 minutes each morning.

By Order of Commissioners of Water Works.

George C. Gensheimer, Secretary,

February 12th, 1911.

By request of the Commissioner of Health that warning placards be posted on highways and in hotels, restaurants and saloons, street cars and public places, on February 11th, the following order was issued:

WARNING.

BOIL THE CITY WATER FOR 20 MINUTES

AND

AVOID TYPHOID FEVER

The prevalence of Typhoid Fever in epidemic form thoroughout Erie makes necessary drastic measures.

Public water, even if pure when drawn from the faucet, may be the medium of transmission of typhoid fever infection where the disease exists on the premises.

To be safe boil for 20 minutes all water used for drinking or domestic or culinary purposes, also boil the milk during the prevalence of typhoid fever in the city and avoid the use of ice harvested from the Harbor.

Per instructions of Samuel G. Dixon, M. D., Commissioner of Health, Commonwealth of Pennsylvania.

Issued February 11, 1911, By Order of M. Liebel, Jr., Mayor; J. W. Wright, M. D., Health Officer.

b. With Respect to Milk.

All dwellings containing a case of typhoid fever were placarded with the usual typhoid poster. The following notice to milkmen was also posted.

NOTICE TO MILKMAN.

This house is under quarantine. The Milkman must not enter.

The family will set vessels outside, into which the milk or cream is to be poured by the milkman, who must not handle the vessels.

Milk or cream must not be delivered in bottles, or tickets received from this house, until this card is removed.

Penalty for violation of this regulation—$5.00 to $100.00.

By Order of the
BOARD OF HEALTH.

Officers of the Engineering Division were stationed throughout the town along milk routes to observe whether the above rules were being followed. It was discovered in not a few instances that milk bottles were delivered into houses where typhoid existed. One peddler was seen to take an empty bottle from the dwelling of a fever victim, and fill it with milk and deliver it to another customer, and it was not denied by the venders that this was frequently done. As it was impossible to thoroughly police the milk routes, there appeared no other way of preventing the danger of the spread of the disease through this medium than by appealing to the local Board of Health. On February 16th, the following order was adopted and issued to all milk dealers licensed by the Erie Health Board:

"Dear Sir:—You are hereby notified that on and after February 20th, 1911, the sale of milk and cream in bottles or other containers of a similar character will not be permitted under any conditions. This regulation applies to stores and milk depots as well as to regular dealers.

"Penalty for violation includes, in addition to prosecution, the revocation of your license.

"By request of the Commissioner of Health of the Commonwealth of Pennsylvania and by order of the Board of Health of the city of Erie, Pennsylvania.

"J. W. WRIGHT,
"Health Officer."

c. General Instructions about Management of a Typhoid Case.

On February 21st, general instructions regarding the care and management of cases of typhoid fever were printed in the newspapers. Copies of these rules were supplied to all families afflicted.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF HEALTH

Rules to be Observed in the Care and Management of Cases of TYPHOID FEVER

WIPE OUT TYPHOID BY KILLING THE GERMS IN THE BED-PAN.

The patient should be confined to one well lighted, well ventilated room, with windows screened against flies and other insects, preferably a room with southern exposure, and as remote as possible from other occupied rooms in the house.

This room should be stripped of fancy curtains, carpets and upholstery and all other furniture not necessary for the comfort of the occupants.

Soiled bed and body clothing, including handkerchiefs and cloths used for collection of discharges from the nose and mouth or those soiled by vomited matter, should be thoroughly disinfected. This may be done by placing in cold water and then boiling for thirty minutes, or by use of some one of the following chemical disinfectants:

Make up disinfecting solutions by adding one-half ounce of Chlorinated Lime (Chloride of Lime or Bleaching Powder) to one gallon of water, or three teaspoonfuls of Liquor Creosolis Compositus or three teaspoonsfuls of Creolin or eight teaspoonsfuls of a solution of Formaldehyde (at least 37½ per cent.) to a pint of water. The solution of Formaldehyde is preferred.

A tub or other vessel containing a sufficient quantity of one of the disinfecting solutions should be kept in a convenient place for soaking bed and body linen.

Place all such clothing in this vessel immediately upon its removal from the bed or body of the patient, and allow it to soak for at least three hours, after which it should be boiled for one hour.

Do not carry such infected clothing through the house, or store it with other soiled material.

Remnants of food left by the patient should be burned.

The nurse, or attendant, should not use eating utensils or drinking vessels from the sick room, nor should she permit others to do so until they have been boiled for at least one-half hour.

A basin or other vessel containing Bichloride of Mercury Solution (one tablet to one quart of water), or other good antiseptic solution should be kept constantly made up so that the hands may be immediately washed after handling any secretion or clothing from the patient.

KILL THE TYPHOID GERM.

The discharges from the bowels, the urine, the expectoration and any vomited matter should be disinfected, by the addition of a quantity of the standard solution of Chlorinated Lime (Chloride of Lime or Bleaching Powder), or Creolin, sufficient to more than cover the discharges, or if the latter are liquid, by adding a quantity equal in bulk.

The contents should be thoroughly stirred, breaking up any solid masses and the vessel with contents should be allowed to stand at least one-half hour before emptying.

Never empty the discharges upon the surface of the ground or into a stream.

If a sewerage system exists, use it, but only after a thorough disinfection of the discharges.

If a privy well exists, use that, or bury the disinfected material one foot below the surface of the ground and not less than one hundred feet from a well or water course. It must be out of the reach of dogs and rats as they will carry the filth on their feet into residences.

Add a disinfecting solution to all water that has been used for bathing the patient, and dispose of it in the same manner as the body discharges.

The air of the sickroom cannot be disinfected during the occupancy by the patient. The practice of hanging up cloths saturated with carbolic acid or of placing saucers of Chlorinated Lime or proprietary disinfectants in the sickroom is not only annoying to the patient, but utterly useless and often injurious.

An abundance of fresh air should be admitted to the room, but the patient should be protected from direct draughts.

Flies must be carefully excluded from the room and any that find entrance should be killed.

Dogs, cats and other household pets should be quarantined and disinfected, and any found running loose should be killed.

Kissing the patient should be prohibited.

Individual milk bottles should not be taken into or removed from the premises during the existence of the disease.

The householder should set a vessel out to receive the milk, and the person delivering the milk should pour it into such vessel without touching it with his hand, or with the vessel from which the milk is poured.

When premises from which milk is sold are quarantined for typhoid fever, the sale of milk from such premises can be continued only under the following conditions.

Those engaged in the production of milk or milk products, or in the cleansing or care of utensils used for this purpose, must be disinfected, together with their clothing and required to keep out of the infected house until a certificate of recovery or death has been issued by the physician in charge, and a certificate of disinfection has been granted by the Health Officer.

Unless such precautions are observed, the County Medical Inspector shall order that the proprietors and their agents shall either discontinue the marketing of milk and milk products or shall arrange for the transfer of stock to other premises free from the above mentioned disease.

Visitors should be excluded from the sickroom. Aside from their disturbing influence on the patient they may through carelessness contract the disease themselves.

Boil all water used for domestic purposes.

Follow these rules during the entire illness, do not relax them during convalescence, but continue until entire recovery, as the specific germ of typhoid may exist in the stools or urine of typhoid patients for at least four weeks after the disappearance of the fever.

After the removal of the patient, the sickroom and everything it contains SHOULD BE DISINFECTED BY FORMALDEHYDE GAS. (This disinfection will be done by the Department's Health Officer on request from physician or householder.) The bed and body clothing should be disinfected by boiling in the same water in which they were placed when removed or should be soaked for three hours in one of the antiseptic solutions already described.

The Act of 1909 requires health authorities to place a warning placard in a conspicuous place on all premises where Typhoid Fever exists.

SAMUEL G. DIXON,
Commissioner of Health.

February 21, 1911.

d. Taking Down of Warning Placards.

Early in March the merchants began to complain because of loss of trade. The Business Men's Association, through the Mayor, requested the Commissioner of Health to announce that the typhoid epidemic had passed. The following bulletin was sent to the Mayor, but it was not published as the said association decided that since the bulletin did not declare that the epidemic was no longer existent, it would be better to leave matters as they were until the Commissioner of Health could safely make the form of announcement which the merchants desired.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF HEALTH

ANNOUNCEMENT.

The typhoid fever situation in Erie is assuring; the epidemic seems to have passed. The present treatment of the water will go a long way toward preventing its recurrence.

This announcement does not mean that improvements to the water works system and the sewerage system are not needed; they are needed, and the public health demands that no delay shall occur in making the necessary permanent changes; but, meantime, health precautions are being enforced in the city as never before in its history. Consequently, Erie is a proportionately safer place in which to transact business than for some time past.

I would continue to boil the water and to follow out the instructions of the State Department of Health.

SAMUEL G. DIXON,
Commissioner of Health.

Harrisburg, Pa.
March 13th, 1911.

The letter to the public by Erie business men, published about this time, is as follows:

"The city of Erie has been visited in the past two months by an epidemic of typhoid fever. This fact has been given wide spread publicity and in many instances has been greatly exaggerated much to the detriment of the business interests of the city. The epidemic has been gradually but surely on the decline until now we are assured by the State and local health officers that there is absolutely no danger of infection, and that the city of Erie today is cleaner and more healthful than it has ever been before. It is therefor the desire of the citizens of Erie that these facts be given the same far reaching and thorough publicity as was the fact given of the existence of the epidemic.

"To that end the citizens of Erie assemblage requested that the press of Erie and other nearby cities and towns use their best endeavors to give this resolution widespread publicity which would be but justice to the city of its people.

"Committee of Erie Businessmen's Exchange."

On March 10th, the Commissioner of Health sent a communication to the Mayor and city councils about garbage and night soil collection and disposal, the sewering of properties and the general cleaning up of the city. One wishing to know the details should refer to that part of this report treating of garbage and night soil.

Cases continued to be reported during March. On April 6th, nine were recorded. This aroused fear that people were becoming careless. The Health Board announced that it would take extraordinary steps to clean up the city. On this day the following communication was received from the Chamber of Commerce of Erie:

"CHAMBER OF COMMERCE

"Erie, Pa., April 6, 1911.

"Dr. Samuel C. Dixon, State Health Commissioner,
"Harrisburg, Penna.

"Dear Sir:—

"We have the honor to address you in behalf of the citizens of Erie relative to the caution cardboard signs placed upon the telegraph poles of our city for the purpose of warning our people against the infection of typhoid fever.

"Realizing that the epidemic has subsided, and that the cases now on record are convalescing, would it not be proper for your department to direct the local Board of Health to remove these signs?

"Our commercial interests have suffered greatly on account of the wide publicity this epidemic has been given, and they are now urging this Organization to take steps looking toward the removal of any further detrimental publicity.

"If in your wise judgment you deem it good policy to order the removal of these signs, please inform us, and we are,

"Very truly yours,

"ERIE CHAMBER OF COMMERCE,
"Jacob Umnitz, Secretary."

On April 13th, the Board of Directors of the said Chamber of Commerce passed resolutions urging upon the Commissioner the removal of the caution signs from the telegraph poles in the city. It was not until the latter part of April, however, that these placards were permitted to be taken down.

11. THE ICE SUPPLY.

The warning of February 2nd, 1911, to the public in Erie relative to ice was as follows:

"Commonwealth of Pennsylvania,

"Department of Health,

WARNING TO THE PUBLIC OF ERIE.

> "No ice harvested from the Erie Harbor should be used in milk or water or be brought in contact with raw vegetables, or food of any character."

The ice in Erie is handled principally by three concerns:—The Mutual Ice Company, the Union Ice Company and the Erie Pure Ice Company.

a—Erie Pure Ice Company.

The Erie Pure Ice Company has a place cor. 25th and Holland Streets, where during the summer artificial ice is manufactured from city water and is stored in sufficient quantity for their winter business which is small. No harbor ice is used. The plant has a capacity of 144 cans in 12 hours, 300 pounds to the can. During the time the Department was in Erie suppressing the typhoid epidemic, the company employed two men only. One wagon was on the road for one half of each day. Three to eight cakes of ice were distributed. In the summer four teams are employed and ten men.

b—Union Ice Company.

The Union Ice Company has an artificial plant at East 20th and Holland Streets and a 20,000 ton building for the storage of harbor ice at the foot of State Street. Seventy-five tons of ice are manufactured every 24 hours and 45 men are employed. On February 10th, 1911, 20 teams were on the road. No harbor ice is supplied for family and household use. It is reported sold only to fish packers. Five thousand tons were cut last winter of which 2,000 remain. None will be harvested during the winter of 1910-11. Sufficient additional machinery is on the ground to increase the manufactured output to care for all of the company's business. The Department analyzed samples of the natural and artificial ice handled by this company, with the result appearing in table XXVII.

TABLE XXVII.

ANALYSIS OF UNION ICE COMPANY ICE.

Date of Sample, 1911.	Artificial.		Natural.	
	Bacteria per c. c.		Bacteria per c. c.	
	Total	B. Coli	Total	B. Coli
Feb. 10,	....	....	12	0
Feb. 14,	8	0	32	0
Feb. 25,	1	0	10	0
Feb. 28,	1	0	6	0
Mar. 1,	1	0	0	0
Mar. 2,	6	0	30	0
Mar. 3,	4	0	12	0
Mar. 4,	8	0	1	0
Mar. 6,	3	0	4	0
Mar. 9,	4	0	12	0
Mar. 10,	0	0	1	0
Mar. 11,	8	0	840	0

c—Mutual Ice Company.

The Mutual Ice Company deals only in the product harvested from the harbor. The ice house is near the foot of Cascade Run and stores approximately 13,000 tons. The company wholesales and retails. During February, 1911, 34 men were employed and 13 wagons were engaged in distributing 35 tons of ice daily. Some of the 1910 cutting was being sold. The Department analyzed samples of that ice and of the 1911 cutting with the results shown in table XXVIII.

TABLE XXVIII.

ANALYSIS OF MUTUAL ICE COMPANY ICE.

Date of Sample, 1911.	Harbor Ice.			
	1910 cutting.		1911 cutting.	
	Bacteria per c. c.			
	Total	B. Coli	Total	B. Coli
Feb. 10,	10	0	10	0
Feb. 14,	420	0	10	0
Feb. 25,	6	0	3	0
Feb. 28,	4	0	11,000	0
Mar. 1,	116	0	27,000	0
Mar. 2,	3	0	2	0
Mar. 3,	36	0	2	0
Mar. 4,	3	0	3,000	0
Mar. 6,	210	0	140	0
Mar. 9,	30	0	8	0
Mar. 10,	60	0	48	0
Mar. 11,	2	0	360	0

The fish companies of Erie use enormous quantities of ice for packing purposes. The Keystone Company has a house with a capacity of 7,000 tons. The Booth Company has one with about 6,000 tons capacity. The Union Fish Company's house holds about 2,500 tons. The Anchor Line and Cold Storage and Produce houses lay in large supplies all for refrigeration.

d—Discussion of Ice as Conveyor of Infection.

Ice is less liable to convey infection into the household than is water or milk or nearly any other article of domestic consumption.

Out of all of the typhoid epidemics in the country, there is not a case, viewed from the standpoint of scientific proof, that has sustained the conclusion, after continued critical scrutiny, that ice was the cause, and out of six reputed ice epidemics that ice was the sole cause.

The supposedly well informed individual views with alarm the cutting of ice for domestic use from waters that do not look fit to drink. Ice is cut near sewer outlets and from contaminated sources. The people very generally have observed this fact and hence one may prefer artificial ice put in his glass in the summer time because this mingling of natural ice and water may be dangerous since it is commonly believed that ice may bring with it germs of infectious diseases. And so of late years the custom of drinking ice water has come to be talked about in certain quarters as a dangerous practice. An aid to this opinion has been the needless harvesting and distribution of ice containing reeds and water grasses and suspended matter. And yet the use of ice water as a satisfying beverage is rapidly increasing and with the increase has come the observation as to the value and harmlessness of the habit.

In the sick room and hospital, cracked ice is eaten raw. As raw food, ice like other uncooked foods and drinks, may be the possible vehicle of disease, more especially typhoid fever from typhoid infected hands. Ice dropped into water for drinking, should not be handled or come in touch with the hands no matter how clean. The man with typhoid, or who comes directly or indirectly in contact with the typhoid patient, is likely to put typhoid into the drinking water when he drops ice with his hands into said water and in this respect it is immaterial whether the ice be an artificial or a natural product.

Over 90 per cent. of the impurities and bacteria are eliminated from the water when natural ice is formed. Storage and continued low temperature effect a further reduction. Cloudy water containing matter in suspension will produce perfectly clear ice. The formation of ice crystals mechanically removes bacteria and other suspended matter which remain in the unfrozen water. The germs of disease that may at first be present in the ice, perish principally for three causes. Firstly, the temperature of the ice is so much lower than that required to maintain vitality that they succumb. Secondly, these bacilli are motile but in ice no movement is possible and they perish for lack of nutrition. And thirdly, they are aerobic bacteria; but ice is impervious to air. To these facts may be attributed bacterial diminution in stored ice.

Sedgwick found that after two weeks' exposure in ice, upwards of 99 per cent. of typhoid germs die, the remaining hardy ones gradually weakening until they perish. He concluded: "as a vehicle of disease, ice is plainly far less dangerous to the public health than is either water or milk."

Sparks found that typhoid bacilli are killed when stored in ice after nine weeks, and that B. Coli Communis is killed after a period of twelve weeks.

The United States Government in Bulletin No. 35 of the Hygienic Laboratory has stated, "Ice cannot be a frequent vehicle by which the infection of typhoid is spread owing to the fact that the great majority of bacteria are killed in the process of freezing."

Winslow found that only 41 per cent. of typhoid bacilli were alive 15 minutes and only 22 per cent. 6 hours after freezing. All investigators are now agreed that three weeks after freezing less than one per cent., and probably less than one half of one per cent, remain alive. Furthermore, in ice bacteria never multiply.

In the table of analysis of the Mutual Ice Company which shows the tests of 1909-10 ice and of 1910-11 (the latter harvested within a month) it is quite apparent that the storage of the ice has had a beneficial effect in its bacterial content, although in none of the samples were sewage organisms present.

But all of this does not prove that it is safe to resort to a contaminated water source for the harvesting of ice. There is danger where the water is infected of an overflow of the ice surface, the freezing thereon of the infection and the subsequent transmission of the infection thus picked up to the consumers. Furthermore, if solid masses of infectious sewage material be frozen into the ice, the life of the enclosed typhoid bacilli might be much longer than the experiments quoted indicate. And finally, from the sense of decency, people will decline to purchase ice harvested from grossly polluted water. The appearance of ice and methods of delivery are factors of growing importance. Health authorities are being empowered to strictly supervise not only the manufacture or harvesting of the ice sold, but also the methods of handling and distribution.

e—Erie Board of Health Rules Governing Ice.

In view of these considerations and others the Department while adhering to its position that it is not safe to cut ice from Erie Harbor to be sold for domestic purposes, would not stop the sale of the ice in storage cut from this source but left the matter to be settled at the discretion of the city Board of Health. The rules and regulations of the city Board of Health governing ice provide as follows:

"No person or persons, firm or corporation, engaged in the business of selling or using ice for the purpose of preserving or cooling any article used for human food or drink, shall obtain said ice from any stagnant pond or pool or from any portion of Presque Isle Bay or slips or basins adjacent thereto, without first filing a written application at the office of the Board of Health for a permit, therefor, said application to set forth the exact location of the place or places from which such ice is to be obtained, and to be accompanied by a certificate of analysis signed by a competent chemist, certifying to the purity of said ice.

"Upon the receipt of such an application and certificate, the Board of Health shall, through its health officer, verify the accuracy of the statements made therein, and if it shall appear that the ice referred to is healthful and fit for human use, they shall issue a permit allowing the cutting and sale of same.

"It shall further be the duty of the health officer to examine or cause to be examined, from time to time, all places where ice may be stored or kept, and to inspect all vehicles from which ice is sold or delivered, to ascertain if they are kept in a healthful and cleanly condition. Also to cause to be made, at such times as may be deemed necessary by the Board of Health, chemical and bacterial analyses of such ice to determine its purity and wholesomeness."

Out of 981 typhoid cases but 42 used ice in water or milk or in contact with food stuffs and of these 42, fourteen use artificial ice only, 24 use harbor ice only and 4 use both natural and artificial ice.

12. BOTTLED SPRING WATER.

There are 7 establishments in Erie supplying bottled spring water to the public. Twenty-seven hundred and twenty-five patrons of the business represent approximately 12,000 persons drinking the water among whom 116 cases of typhoid fever occurred during the epidemic or less than one per cent. In the following pages a description of source and the manner of conducting the business and the Department's analyses of the water are given. No suspicion attached to the spring waters as the cause of the fever outbreak or of its spread. The word "customer" as used means the householder and not the number of people in the dwelling or place of delivery.

TABLE XXIX.

ERIE'S BOTTLED SPRING WATER ESTABLISHMENTS.

Name of Water.	Gallons sold daily.	No. of customers or place of delivery.	Typhoid cases among customers during the epidemic.
a. Massassaqua Mineral Spring,	500	625	32
b. Oakdale Spring,	150	200	6
c. Cascade Mineral Spring,	225	200	14
d. Harbor Creek or Glen Crystal Spring,	150	300	8
e. Puritas or Butler Mineral Spring,	600	1,000	41
f. Glenwood Mineral well,	250	300	7
g. White Rock Artesian well,	250	100	8
	2,125	2,725	116

a—Massassaqua Mineral Springs.

Inspected Feb. 3, 1911. Fred W. Wolf, Proprietor, 1034 7th Street, Erie.

Massessaqua Mineral Spring is located in Mill Creek Township a short distance from the city limits. The spring is located in a field of several acres in which there are no buildings other than the spring house used exclusively for bottling plain and carbonated spring water. The spring is protected from the entrance of surface drainage and pollution from outside. Earthen mounds and cement gutters and pavements are used to keep out surface drainage. The part of the spring house covering the spring is separated from the bottling works so that no one can reach the spring. The spring house, as a whole, is clean and in excellent sanitary condition. A gasoline driven pump raises the water from the spring into a tank. From this tank water is obtained for filling bottles and also for washing the bottles. The tank is covered, the water from the tank being piped to the points where the bottles are washed and filled.

Two men are employed in the spring house and two men deliver water about the city from wagons. All bottles before filling are washed, sterilized in steam heated water and rinsed in a patent self rinsing machine. All wash water goes to a sewer that carries the water away from the spring to a lower level.

Usually from 30 to 40 five gallon bottles and 600 one half gallon bottles are sold daily representing 625 customers. The five gallon bottles are sold at hotels and public buildings, while the ½ gallon bottles are principally for family use. The small bottles have porcelain stoppers with rubber fittings, while the large bottles have corks. The corks are boiled in water and dried after using.

There has been no sickness of any kind among the workmen or those connected in any way with the sale of the spring water for over a year from the time of inspection.

Two samples of water were collected on February 3rd, the results of which were as follows:

	Bacteria per c. c.	B. Coli per c. c.
Tap at spring house,	2	0
Overflow from tank,	315	0

b—Oakdale Springs.

Inspected Feb. 3, 1911. Charles E. Ball, Proprietor, Erie R. F. D.

The Oakdale Springs are two in number and located in Mill Creek Township at the foot of a hillside. The spring is on a farm property about 335 feet from the farm house and at a lower level than the ground level about the farm house and other nearby buildings. The drainage from the house cannot come near the spring. The soil is of a sandy nature and percolation is rapid. A building for bottling purposes is located near the springs and contains the filling tank which receives the water direct from the spring. The building is devoted entirely to the preparation of the spring water.

Each spring has a 24 inch terra cotta tile stood over the point where the water issues from the ground. The top of each terra cotta tile is cemented shut. The earth about the tiles is mounded and the surface cemented and sloped from the springs so that no surface water can reach the tile or stand about the tiles. The suction of a motor driven pump enters each tile and the water is pumped to a small storage or filling tank in the bottling house. As the water passes through the pump to the tank it passes through a Berkfield filter which is inserted in the pipe line and forms a part of it. The tank is covered and protected from dust.

Mr. Ball does all the work about the bottling house and delivers the water from an open wagon to his customers in the city. In the cleaning of the bottles he uses a preparation called the "Giant Cleanser."

Mr. Ball serves about 150 gallons of water daily to 200 resident customers. Nearly all the water is put in ½ gallon bottles. A few five gallon bottles are sold. All bottles are porcelain stoppered with rubber fittings, except the five gallon bottles which have cork stoppers.

There has been no sickness during the year previous to time of inspection among any of those connected with the care of the spring water

On February 3rd a sample of water was taken from the pump which showed 300 bacteria and no colon bacilli.

c—Cascade Mineral Springs.

Inspected February 3rd, 1911. Company office in Erie City.

The Cascade Mineral Spring is located in Mill Creek township on the same farm as the Oakdale Spring but about ¼ mile distant. The spring is 12 by 14 feet and 8 feet deep. It is walled about with a brick masonry wall. Over the spring is a frame building, old but in good condition. No surface drainage can enter the spring. From the spring, water is raised by an electrically driven pump into a trough shaped tank from which project four spigots so that four bottles may be filled at the same time. One half gallon and five gallon bottles are used. About 225 bottles are delivered daily to 200 customers in Erie City. The one half gallon bottles have porcelain stoppers with rubber fittings. The five gallon bottles have corks. The cork stoppers are boiled and dried after each using. All bottles are rinsed in boiling water after cleaning. Occasionally sand is used when cleaning to brighten the glass.

There has been no sickness among those in any way connected with the preparation of the water for over one year.

On February 3rd two water samples were collected from the spring water. the results being 100 bacteria and 0 colon bacilli; 32 and 0.

d—Harbor Creek or Glen Crystal Spring.

Inspected February 4th, 1911.

Harbor Creek Spring, which is often called Glen Crystal Spring, is located in Harbor Creek Township, Erie County. Mrs. J. C. Pierce is owner and Mr. J. C. Pierce, manager. This spring is located on a precipitious bank bordering Six Mile Creek. The bank is about 275 feet in height. One hundred and twenty-five feet up the bank from the stream the spring issues from rock strata. The excavation about the spring is 3½ by 4½ feet and 2 feet in depth. The spring is covered by a frame building 10 by 12 feet and about 8 feet in height. The building is without a roof. About the building are cement gutters to carry off surface drainage. The building serves simply as a protection from outside entrance. The water leaves the spring through a 2 inch galvanized pipe, running 280 feet to the dwelling of Mr. Pierce where one room is used exclusively for the washing and filling of water bottles. The flow from the spring is estimated to be about one gallon a minute. About 300 half gallon bottles are delivered daily to Mr. F. L. Trace of Erie who retails the water about the city. Mr. Pierce and Mrs. Pierce do all the washing and filling of the bottles, and Mr. Pierce makes the delivery to Erie. All bottles are boiled, rinsed and scalded in hot water before filling. All have porcelain stoppers with rubber fittings. The hillside above the spring is uninhabited and seldom visited of its inaccessibility. At the terminal of the embankment is plateau formation for some distance. This plateau is cultivated but not inhabited.

There has been no sickness of any kind among these connected with the preparation of the water for 12 years.

On February 4th two samples of the water were examined as follows:

	Bacteria per c. c.	B. Coli per c. c.
Harbor Creek Spring tap at bottling house,	6	0
Harbor Creek Spring at spring,	80	12

From the inspection of this spring it is believed there is little or no chance of pollution and because of the difficulties encountered in reaching the spring to collect the samples it is believed an error may have been made in gathering the sample.

On February 16th two more samples were collected from Harbor Creek Spring which gave the following results:

	Bacteria per c. c.	B. Coli per c. c.
Harbor Creek Spring tap in bottling house,	20	0
Harbor Creek Spring at spring,	26	0

e.—Puritas or Butler Mineral Springs.

Inspected February 5th, 1911. Mr. J. Butler, Proprietor, No. 2401 Peach Street, Erie.

The Puritas Mineral Spring is located on a hillside in Mill Creek Township about one mile from Erie City. The hillside is uninhabited and covered with timber. About 100 feet up the hillside the spring water issues from rock strata, The spring is covered by a concrete dome shaped structure which is in turn covered with about 5 feet of earth. It is believed that no surface water can gain entrance. The water is conveyed through a 1½ inch galvanized pipe to a concrete tank in a single story concrete bottling house, 30 feet by 30 feet and located at the foot of the hill. The tank is closed and can be entered only by way of the manhole in its side. The tank has four outlets equipped with spigots. Three of these are within the house and are used for filling bottles while the fourth is outside the building. About 1,000 customers are served with about 600 gallons daily. A tank wagon holding approximately 450 gallons is used in delivering water to customers using large amounts. Water coolers and five gallon bottles are brought to the wagon as it goes about the city and are filled from the spigot on the tank The remainder of the customers are served with gallon and half gallon bottles delivered from a wagon used exclusively for this purpose.

The premises on which the spring and spring house are located were found to be in excellent sanitary condition and apparently there was little or no chance of pollution. Giant cleaning powder was used in cleaning the bottles and all the bottles were boiled and rinsed before refilling.

There has been no sickness among those connected with the preparation of the water for over one year from the time of inspection.

On February 5th a sample of water collected from the water line delivering the spring water into the tank in the spring house had the following bacteriological content:

	Bacteria per c. c.	B. Coli per c. c.
Puritas Mineral Spring,	3	0

f—The Glen Wood Mineral Well.

Inspected Feb. 5th, 1911. C. J. Blass, Proprietor, 1526 Peach St., Erie.

The Glen Wood Mineral Well is located in Mill Creek township a short distance south of the city limits. The well is drilled 72 feet, the last 45 feet being in rock. The well casing extends a short distance into the rock. The size of the driller is unknown. Over the well is built a small concrete building used only for the protection of the water. This building is connected to the dwelling house. All water is pumped by a hand operated pump into gallon buckets and then poured into small sand filled filtering tanks. The bottles are filled from taps on the small filtering tanks.

About 250 gallons are delivered daily to approximately 300 customers in the city. Usually small sized bottles are used. All bottles are scalded and washed and again scalded before using. Mr. Blass employs two assistants in handling the water. Delivery is made from a covered wagon. The sanitary conditions about the bottling house and surrounding property are excellent. There has been no sickness among those engaged in the preparation of the water for over one year.

Results of two samples collected February 5th were as follows:

	Bacteria per c. c.	B. Coli per c. c.
Filter tap of Glen Wood Mineral well,	4	0
Pump discharge Glen Wood Mineral well,	1	0

g—White Rock Artesian Well.

Inspected Feb. 5th, 1911. Levi P. Waidley, Prop., Erie R. F. D. No. 1.

The White Rock Artesian Well is located in Mill Creek township about 8 miles from the city limits. The well is 5½ inches in diameter, 83 feet deep with 50 feet of casing which reaches to rock. It is reported that the earth stratum is principally blue clay until rock is reached. As much as 5 gallons per minute has been pumped from the well and apparently its capacity is much greater. The ground surface about the well is covered for several feet with a cement floor, 2½ inches thick. A frame building 12 x 14 and 10 feet in height is built over the well and used for bottling purposes only. The entire floor of the building is covered with cement pavement. Water is pumped from the well into a tank in the upper part of the building. From this tank the water passes through a small sand filter similar to the one used at the Glen Wood Mineral well. From this filter the bottles are filled from taps connected to the filter. About 250 gallons daily are sold in two and five quart bottles to William W. Uuch in Erie. Water bottles are transported in a canvass covered wagon. The sanitary conditions about the place are excellent. There has been no sickness among those engaged in the preparation of the water for over one year.

Water samples collected February 6th showed the following results:

	Bacteria per c. c.	B. Coli per c. c.
Water at tap of filter,	2	0
Water at tap of filter,	0	0
Water inlet to filter,	20	0

13. OYSTERS.

Practically all of the oysters used in the city of Erie are wholesaled by three dealers, William Shaaf, the Erie Fish Company and the Fulton Market. The following is a brief description of the business of each one:

a—William Shaaf.

William Shaaf conducts a wholesale and retail grocery and green goods store at 1009 Ash Street. He does not handle shell oysters at all but deals entirely in packed oysters.

The oysters are obtained from L. M. Buttle, Oyster, Va., A. H. and J. T. Mears, Wachaprague, Va., and C. S. Orleman, Oyster, Va. These are ocean oysters, gathered from the inlets along the eastern shore of the peninsula portion of Virginia. They are shipped in one, three and five gallon air-tight cans in boxes surrounded with ice. These cans are then delivered by Mr. Shaaf in the original package to the wholesale trade.

He wholesales to 62 customers who have small stores and buy the oysters in one gallon cans. Mr. Shaaf does not do a retail business. He wholesales from 300 to 700 gallons per month, during the entire oyster season.

b—Erie Fish Company.

The Erie Fish Company is owned by Mr. T. B. Walker and the store is located at 23 N. Park Avenue. The oysters are obtained from the Lewis Blue Point Oyster Co., Sayville, L. I., F. Mansfield's and Sons Co., Fair Haven, Conn., and the Andrew Radel Oyster Co., South Norwalk, Conn. Occasionally the oysters are obtained from A. H. and J. T. Mears, Wachaprague, Va., and J. Merrill Co., New York.

Few oysters are sold in the shell. Mr. Walker says he sells about 60 to 70 barrels in the shell per season. This shell trade is all retail. The shell oysters are obtained from the Lewis Blue Point Oyster Co. The majority of the oyster trade at this store is in bulk or packed oysters. The greater part of the bulk oysters are obtained from F. Mansfield's Sons Co. and the Andrew Radel Oyster Co. Mr. Walker owns his own carriers or shipping tubs. These are sent to the companies and are then filled with cans of oysters surrounded by ice. These are heavy galvanized, air-tight five gallon cans and when empty are returned to the company for refilling. About 3,000 gallons of oysters are handled in a season and of this amount 75 per cent. is sold in the original package without opening or about 2,250 gallons. Of this amount only about 25 per cent., or 550 gallons, is sold in Erie, the remainder being sold to outlying towns and districts. The Erie Fish Company sells wholesale to the following Erie stores which have only a small trade:

Great Eastern Tea Co., Grocers, 2611 Parade St.
W. C. Shakelton, Grocer, 302 W. 8th St.
F. W. Newsham, Grocer, 1144 W. 8th St.
A. Foht, Grocer, 502 W. 8th St.
August Schutte, Grocer, 408 State St.
Chas. Hagamann, Grocer, 2932 Peach St.
John Tobin, Grocer, 402 W. 8th St.

About 25 per cent. of the Erie Fish Company's oyster trade is retail. The oysters are placed from the cans in which they are shipped into a jar which is covered with glass and surrounded with ice so that no water can get into the oysters, and are retailed from this jar.

c—Fulton Market.

This is the name of a company which operates a grocery, meat and fruit and fresh vegetable store at 703 State St. The president and manager of the company is Mr. Chas. L. Sidgwick. Mr. Sidgwick handles exclusively the oysters shipped by the Sealshipt Oyster System, the general office of which is at South Norwalk, Conn. Besides owning a large amount of oyster beds the Sealshipt Company has affiliated with it about one hundred individual shippers. The beds which are owned or under control of the Sealshipt Company are located in the three oyster districts. These are the Northern district which comprises the Great South Bay, Narragansett Bay and Long Island Sound beds; the Cheasapeake district, which comprises the beds in the Chesapeake Bay and the Gulf district which comprises the beds in the various bays along the coast of the Gulf of Mexico.

The method of handling the oysters by the shippers is as follows: The oysters are shucked and all slime and dirt removed. After draining the solid oysters are put into pressed steel containers holding five gallons each. These are closed and sealed and are then air tight. The containers are then embedded in ice and the shipping cases are so constructed that they will keep the oysters in good condition for a long period and without freezing. The containers and shipping cases are owned by the Sealshipt Co. They are returned to the company after emptying and used again for shipping, the containers being sterilized before using again. All persons retailing Sealshipt oysters are required to handle them in regular retailing cases. This consists of a porcelain outer cylinder with a porcelain and glass top. There is also an inner cylinder lined with porcelain. Ice is placed between the two cylinders. Rubber packing makes the case dust proof and air proof. These cans are only rented to the retailer and they are not allowed to use water or ice in direct contact with the oysters, the oysters being placed directly from the shipping containers to the inner cylinder of the case. It is claimed that bacteriological examinations are made at regular intervals of the waters from which the oysters are taken. These examinations are made at the Lederle laboratories in New York City.

In addition to the shucked and packed oysters the Sealshipt Company also handle shell oysters.

The Fulton Market is the largest dealer in oysters in Erie. It retails about 18 to 20 barrels of shell oysters a month. These come from Sayville, Long Island, from the great South Bay or Blue Point bed district. It also handles from 8 to 9 thousand gallons of packed oysters each season. About two-thirds of this quantity is sold in Erie or about 5 or 6 thousand gallons a season and about one third is shipped to the towns and districts surrounding Erie. Of the oysters sold in Erie from 1,500 to 2,000 gallons are sold wholesale to various grocers around the city. The remainder of the trade is retail. All wholesale oysters are delivered in the unopened containers just as received from the shippers. The following is a list of the Fulton Market's wholesale customers:

P. A. Becker, Grocer, 6th and Front St.
August Schutte, Grocer, 408 State St.
Geo. D. Williams, Grocer, 721 State St.
Fred Newsham, Grocer, 1144 W. 8th St.
West Side Meat Market, 360 W. 8th St.
Froehlick and Wimmer, Grocers, 2226 Holland St.
Doerrler Bros., Grocers, 820 Parade St.
Public Grocery Supply Co., 1507 State St.
F. G. Eisert, Grocer, 6th St. and East Ave.
F. S. Patton and Sons, Grocers, 751 E. 18th St.
A. Foht, Grocer, 502 W. 8th St.
Z. E. Kingsley, Grocer, 301 W. 18th St.
C. H. Brandler, Grocer, 440 W. 18th St.

As nearly as could be ascertained during the season lasting from September 1st to April 30th about 200 barrels of shell oysters and about 10 to 11 thousand gallons of bulk or shucked oysters are sold in the city of Erie. All of the shell oysters are sold at the Shaaf and Fulton Market Stores and about 5,000 gallons, or about 50 per cent. of the shucked oysters are sold at these stores. The remaining quantity is sold at 73 stores in various parts of the city.

The preponderance of oysters used in Erie came from waters regularly tested at the Lederle Laboratories of New York City and the oysters were examined by the same experts and certified as to purity. Furthermore, the distribution of typhoid cases and the run of the epidemic, and the manner in which the oysters were handled and the freedom from sickness of all persons engaged in the wholesale or retail handling of oysters relieved this food product from suspicion or having been a contributory cause of the onset or spread of the epidemic.

14. Fruit and Vegetables.

Charles Palmisano, 1724 Peach St., Louis Phillip, 451 W. 16th St., and the Rossi Fruit Co , 1614 Peach St., control the banana trade and the greater part of the trade in fruits not grown in the immediate vicinity of the city of Erie. Most of the small dealers purchase their supplies from the above wholesalers.

The principal fact elicited upon investigation was that no green bananas are taken away from the premises of these three dealers by street venders to ripen at the venders' homes. The green bananas are kept on the wholesalers' premises and if purchased before ripened are tagged and taken away as they ripen.

The manner in which vegetables are grown and placed upon the market in the city was investigated. Ten of the largest truck farmers' estates were examined. Nearly all of the celery used in Erie after December is shipped in from a long distance.

A number of farmers conduct small truck patches just outside the city and market the product during the summer months only. Most of the farmers having small milk routes are growers of some green vegetables which they sell during the season. No night soil is used as fertilizer by these farmers. The Department found no cause for suspecting any food stuffs in connection with the transmission of typhoid fever for the period investigated.

15. THE MILK SUPPLY.

a—Typhoid Among Patrons of City Milk Dealers.

The typhoid epidemic was not of milk borne origin.

Milk venders might have spread the disease after it got widely seated in the city; but there is absence of evidence that the disease was disseminated in this way to any extent.

The proof of these assertions follows.

Briefly, no person is permitted to deal in milk or cream in Erie without first having obtained a license. The licensed dealer or vender must keep the city Board of Health informed of whom he obtains his supply, and he shall not distribute milk or cream from any other than a healthy animal so certified by a veterinarian to the satisfaction of the health authorities.

There were in Erie during the epidemic, three citizens who owned a cow each and produced milk on the premises supplying a few quarts daily to neighbors; one vender who peddles milk along a route carrying the product in a basket, the supply being purchased from a dairyman; 92 milk routes operated daily by 60 dealers and 107 stores and 11 ice-cream manufacturers engaged in business under the said license system. All of the milk and cream was handled through these channels with one or two immaterial exceptions.

There was a total of 487 dairies supplying milk and cream to the city of Erie. One hundred and eighty of them were in Crawford County and the balance in Erie County. Not a case of typhoid fever occurred at one of these places of production or among those handling the milk. The county medical inspector for these counties personally visited every typhoid patient in his district. The city milk inspector made a special sanitary investigation of every one of the dairies during the epidemic. The inspections by the State Department officers of the Engineering Division were made at the creameries and principal points of shipment, particularly with respect to the methods of handling the milk and keeping it clean.

The Erie County Milk Association is the greatest dealer. It not only collects and brings the milk to the city but distributes it.

Of 981 cases of typhoid fever canvassed in the city, 17 were reported as receiving no milk whatsoever and 22 as using condensed milk only, making 39 who did not use natural milk or cream, leaving 942 who were supplied with milk. Of this number 7 were supplied from their own or neighbors cows, 10 from unknown sources, 17 from stores supplied from doubtful sources not charged to dealers and 908 cases occurred among the patrons of 57 dealers conducting milk routes. But among these dealers there were 941 cases which gives 33 typhoid victims receiving milk from more than one of the dealers. In table XXX the 941 cases occurring among the patrons of the dealers conducting milk routes are given with other data:

TABLE XXX.

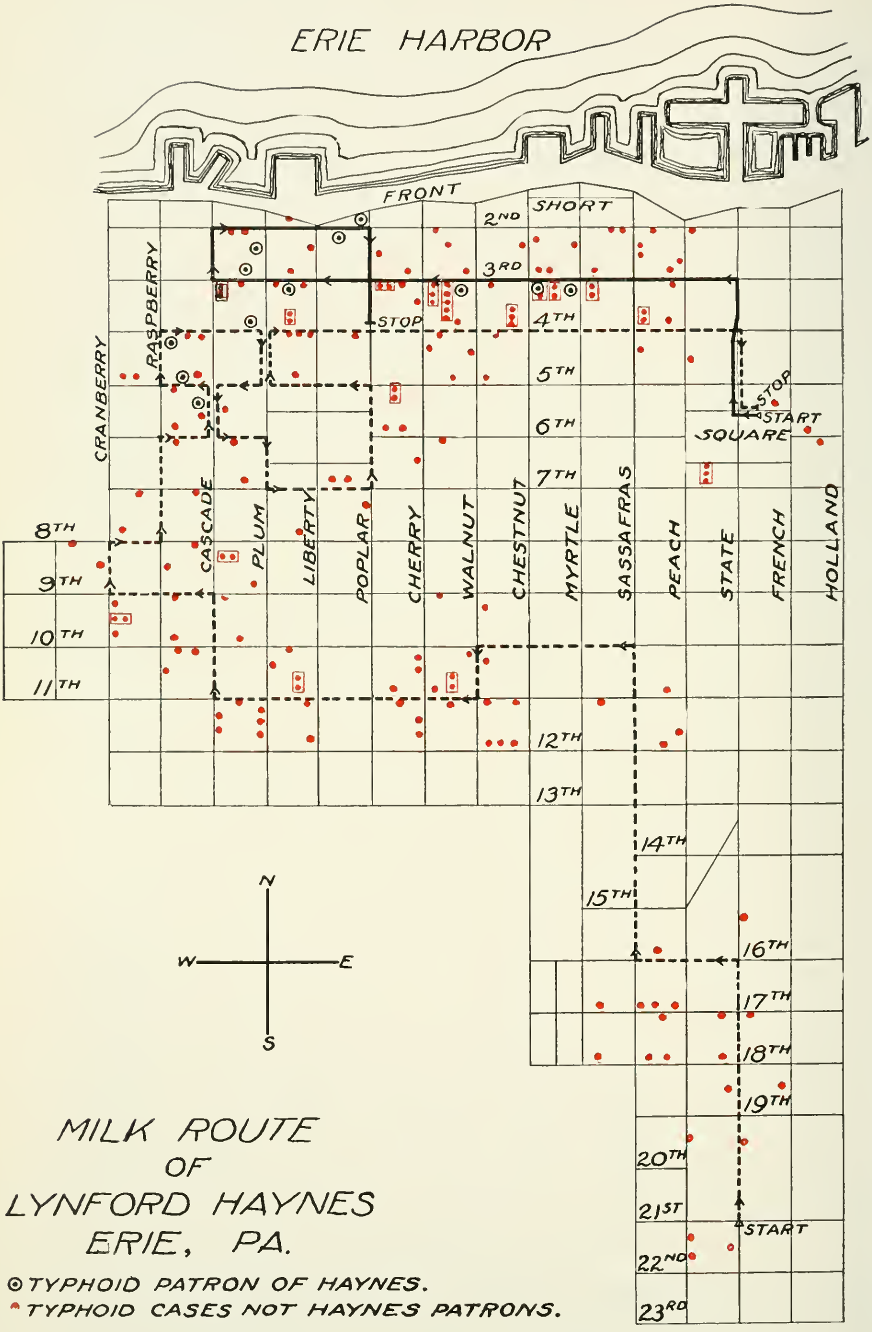
TYPHOID CASES AMONG THE PATRONS OF EACH DEALER ALONG HIS MILK ROUTE.

Dealer.	Persons supplied.		Milk in quarts daily.	Cases typhoid.	
	Families or customers.	Approximate number of individuals.		Among patrons.	Individuals to each case.
1. Arbuckle,	75	300	64	3	100
2. Austin, L. B.,	80	320	100	5	64
3. Austin, S. E.,	170	680	220	1	680
4. Barron,	85	340	80	7	49
5. Benner,	1,800	7,200	3,000	138	52
6. Bleil,	150	600	160	8	77
7. Cook,	200	800	210	11	72
8. Davison,	150	600	170	8	77
9. Delporto,	200	800	195	13	61
10. Eckle,	220	880	225	16	55
11. Engesser,	100	400	104	3	133
12. Engle,	100	400	160	3	133
13. Erie County Milk Association,	5,000	20,000	6,820	332	60
14. Evans Bros.,	110	440	184	3	146
15. Farver,	150	600	180	8	77
16. Finnegan Bros.,	215	860	200	9	95
17. Gardner,	180	720	200	7	102
18. Haynes,	75	300	80	12	25
19. Heidecker,	150	600	210	7	88
20. Heitzman,	200	800	220	12	66
21. Helman,	100	400	180	33	12
22. Honard,	100	400	150	6	66
23. Hutchinson,	200	800	206	6	133
24. Janulewski,	130	520	190	10	52
25. Kauffman,	175	700	195	8	88
26. Kuntz,	160	640	200	15	43
27. Laszczewski,	140	560	160	9	62
28. Loesch,	125	500	140	8	62
29. Love,	225	900	450	9	100
30. Martin, A. M.,	140	560	160	5	112
31. Martin, E. P.,	200	800	280	7	114
32. Miller, E. H.,	175	700	195	5	140
33. Miller, Nick,	150	600	160	9	66
34. Monroe,	225	900	240	10	90
35. Nick, H. A.,	100	400	225	8	50
36. Nick, J. C.,	110	440	155	8	55
37. Pollock,	225	900	240	12	75
38. Rinderlee,	100	400	150	14	28
39. Ripley,	114	456	160	8	57
40. Rubner,	160	640	170	6	106
41. Schauble,	150	600	180	11	54
42. Schweinhardt.	140	560	200	9	62
43. Sedgwick,	150	600	125	4	150
44. Senger,	175	700	200	7	100
45. Stewart,	300	1,200	300	10	120
46. Tarbell,	800	3,200	800	25	128
47. Turner,	120	480	132	5	96
48. Waldinger,	165	660	200	7	94
49. Watson,	....	....	....	1	....
50. Werren,	123	492	235	5	98
51. Weschler,	150	600	205	6	100
52. Wolf,	100	400	165	7	57
53. Wurst,	175	700	240	10	70
54. Yochim, Jacob,	115	460	225	8	57
55. Yochim, Julius,	200	800	210	5	160
56. Yochim, P. H.,	320	1,280	320	15	85
57. Young,	125	500	170	4	125

b—Helman's Milk Route.

Analyzing the cases on the routes of Helman, Haynes, and Rinderlee, those dealers having the highest percentage of typhoid fever among their customers, it appears that along the Helman route in one family three cases occurred and in two other families 2 cases each occurred. On Hazle Street in one block 7 cases occurred between January 18th and February 19th. There was visiting back and forth. In 4 instances only did the families receive filk in bottles all the other

(CHART No. 4)



MILK ROUTE
OF
LYNFORD HAYNES
ERIE, PA.

customers were supplied from milk in bulk kept in cans. Out of 180 quarts sold daily, 15 only were delivered in bottles. If the bulk milk were infected on any single day, naturally a number of onsets would have followed about the same time. The fact is that the cases were distributed among his customers from December 26th, to March 17th, one being in December, 13 in January, 12 in February and 7 in March. Furthermore, along parts of his route where there were a considerable number of typhoid fever cases none of them happened among his customers. He supplied a district adjacent to the reservoir.

c—Haynes' Milk Route.

Haynes drove two routes as is shown in Chart No. 4. He started in the city at 21st street and passed northerly and easterly by a circuitous route to the square. This being denoted Route No. 1. He then took on more milk at the Square trolley station and drove out along west Third and Second streets, denoted Route No. 2. By reference to the chart it will be noted that the second route passed through a district dotted with typhoid cases of which eight only were supplied with milk by Hayne. No two cases occurred in the same household among his patrons. The order successively in which he delivered milk along the route to the customers where the disease occurred and the onset for route No. 2 was as follows:

TABLE XXXI.

ROUTE NO. 2.

Order of delivery.	Address of patient.	Date of onset, 1911.	Remarks.
1,	319 West 3rd St.,	March 31st.,	Latest onset.
2,	339 West 3rd St.,	Feb. 4th.,	Primary.
3,	507 West 3rd St.,	Feb. 25th.,	Possible secondary.
4,	815 West 3rd St.,	Feb. 9th.,	Possible secondary.
5,	910 West 3rd St.,	Jan. 25th.,	Earliest onset.
6,	221 Plum St.,	Feb. 19th.,	Possible secondary.
7,	713 West 3rd St.,	Feb. 1st.,	Possible secondary.
8,	704 West 3rd St.,	Feb. 6th.,	Possible secondary.

The February 4th onset might have been primary to the February 9th and 25th onsets. The January 25th case might have been primary to those of February 1st, 6th and 19th, respectively. There is no proof of this. Haynes supplied all his milk in bottles. He might have interchanged. There would be more reason to suspect this agency if West Third Street were not at the time the most densely infected district of the city.

Data relative to Route No. 1 onsets are as follows:

TABLE XXXII.

ROUTE NO. 1.

Order of delivery.	Address of patient.	Date of onset, 1911.	Remarks.
1,	507 Cascade St.,	March 13th.,	Latest onset.
2,	1028 West 5th St.,	Feb. 2nd.,	Primary.
3,	1049 West 4th St.,	Feb. 22nd.,	Possible secondary.
4,	926 West 4th St.,	Jan. 26th.,	Earliest onset.

At a glance the only case along Route No. 1 that could possibly have been secondary through Haynes agency was that of February 22nd. As the chart shows, no cases occurred among the patrons of Haynes for a mile or more along the route until he came into the thickly infected district.

d—Rinderlee's Milk Route.

The typhoid cases along Rinderlee's route arranged in order as they were reached were as follows: Table XXXIII:

TABLE XXXIII.

Order of delivery.	Address of patient.	Date of onset, 1910-11.	Remarks.
1,	2931 Pine Ave.,	Jan. 25th.,	Uncle.
2,	2923 Pine Ave.,	Feb. 26th.,	Nephew, secondary.
3,	528 E. 27th St.,	Feb. 18th.,	Nurse, secondary.
4,	419 E. 26th St.,	Dec. 25th.,	Primary.
5,	419 E. 26th St.,	Feb. 8th.,	Secondary.
6,	2522 Parade St.,	Feb. 9th.,	
7,	506 E. 24th St.,	Dec. 24th.,	Primary.
8,	506 E. 24th St.,	Jan. 20th.,	Secondary.
9,	506 E. 24th St.,	Jan. 25th.,	Secondary.
10,	621 E. 21st St.,	Jan. 30th.,	
11,	16 Hickory St.,	Jan. 3rd.,	Primary.
12,	16 Hickory St.,	Feb. 5th.,	Secondary.
13,	521 E. 11th St.,	Jan. 15th.,	
14,	546 E. 11th St.,	Feb. 15th.,	

Along Rinderlee's route, the first case in order of delivery of milk was January 25th, cause unknown. The February 26th patient was a nephew who received the infection by contact. The February 18th case was of a trained nurse who got the infection by contact.

The February 8th onset was secondary to the primary case of December 25th in the same household, cause unknown. The January 20th and 25th onsets were secondary to December 24th case in the same household.

Thus far we have primary cases on December 24th and 25th, on January 25th and 30th and February 9th. This does not look like milk infection. Rinderlee peddled his milk in bulk, never in bottles. If a batch of milk were infected, there would naturally have been more than one or two cases of typhoid fever resulting at the same time.

Continuing on Rinderlee's route, but 14 blocks away, many customers intervening, he had among his patrons a victim of typhoid on January 3rd, primary to that of February 5th in the same household. And in the thickly infected district a long distance beyond and on the latter part of his route, there were on January 15th and February 15th, one onset each in different houses. The Department concluded that proof was lacking of milk playing any part of the infection among Rinderlee's customers.

All of the 57 milk routes were carefully studied in this manner, resulting in the elimination of milk as an important contributary cause of the spread of the epidemic along the routes.

e—Erie County Milk Association.

The Erie County Milk Association operated 21 retail and 2 wholesale milk routes. Benner operated 7 retail routes. In Table XXXIV the distribution of the Association milk and typhoid onsets is shown:

TABLE XXXIV.

DISTRIBUTION ERIE COUNTY MILK ASSOCIATION AND TYPHOID DATA.

Number of Route.	Patrons.		Milk in.			Typhoid among patrons.	Number of individual patrons to each case.
	Families or customers.	Approximate number of individuals.	Qt. Bot.	Pt. Bot.	Can.		
1,	218	872	239	....	....	19	46
2,	222	888	192	130	76	25	35
3,	182	728	160	120	50	18	40
4,	364	1,456	187	136	46	8	182
5,	256	1,024	243	140	75	8	128
6,	238	952	168	169	29	10	95
7,	280	1,120	282	208	56	23	49
8,	206	824	156	154	109	14	58
9,	188	852	180	83	44	10	85
10,	186	744	132	70	62	9	82
11,	196	784	230	100	....	6	130
12,	274	1,096	192	199	11	16	68
13,	172	688	128	120	115	12	57
14,	200	800	151	116	96	22	36
15,	182	728	92	116	48	19	38
16,	174	696	109	91	63	20	35
17,	224	896	122	74	166	13	69
18,	118	472	91	60	388	5	94
19,	240	960	171	106	17	6	160
20,	226	904	124	83	75	16	56
21,	182	728	107	114	49	16	45
22,	304	1,216	233	155	51	20	60
23,	148	592	115	79	331	17	35
	4,980	....	3,804	2,623	1,957	332	....

The table shows that most of the milk is handled in bottles. At the milk depot on State Street the Company receives the milk in cans from the farmers and after being weighed it flows by gravity to vats where the temperature is raised to a uniform degree to facilitate the separating of the milk and cream in order to remove all dirt. This cleansing process being completed, the milk and cream is then mixed and pasteurized at a temperature of 165 degrees F. Then it is bottled, ready for delivery.

The returned empty bottles are first rinsed, then cleansed by brushes if necessary and then they are placed in crates, inverted and passed to the washing machine, vertical jets of hot water containing solutions of cleansing powder and jets of live steam and of rinsing water are in turn automatically injected up into the bottles in their progress through the machine. The crates are washed and sterilized in the machine at the same time. No handling of the bottles is permitted. When taken out the bottles remain in the same crate ready for filling and delivery.

f.—Benner's Milk Route.

Benner's milk business is on Cherry Street. He has modern apparatus for the cleansing and the sterilizing of bottles and milk cans. He retails about 500 quarts daily in bottles and 2,500 quarts daily in cans. Therefore were his milk infected. the prevalence of typhoid should appear in the records as above the normal among his customers. In Table XXXV it will appear that the approximate number of patrons of his milk to each case of typhoid fever among said patrons was not below that of other dealers:

TABLE XXXV.

No. of Route.	Typhoid among Benner patrons.	Approximate number of patrons to each case of typhoid.	Cases not supplied by Benner.
1,	22	37	115
2,	20	50	90
3,	19	70	145
4,	20	50	130
5,	12	60	74
6,	26	40	83
7,	19	60	115
	138	....	752

g.—The Stopping of Milk Delivery in Bottles.

The danger always existing in a typhoid epidemic that carelessness will prevail where peddlers are permitted to deliver goods to households containing the disease, officers of the Department were stationed around town to watch the milk delivery operations. It was discovered that drivers with few exceptions when running short of bottles would take empty bottles that had not been returned to the milk depot for cleaning and sterilization and fill these empty bottles after washing them out at the next house or favorable opportunity. One driver when caught disobeying the Board of Health regulations frankly admitted the custom. He said he frequently filled clean bottles. If the bottles did not look clean he would stop at the next house and wash the bottle out, then fill it with milk and leave it at the next place. He said that all vendors at times did the same thing.

The Department inspectors discovered that customers would come into stores with empty bottles not very clean and take back to their homes new filled bottles. The empty bottles would finally be returned to the vendor who might use them again before washing. Especially because of the delayed diagnosis and reporting of typhoid fever cases and hence delayed placarding of the house, the danger was greater. Consequently, the Commissioner of Health requested that the city Board of Health temporarily stop the sale of milk in bottles.

As previously mentioned, the following order was adopted on February 16th, and issued to all milk dealers and other persons licensed by the Erie Health Board:

"Dear Sir:—

You are hereby notified that on and after February 20th, 1911, the sale of milk and cream in bottles or other containers of a similar character, will not be permitted under any conditions. This regulation applies to stores and milk depots as well as to regular dealers.

Penalty for violation includes, in addition to prosecution, the revocation of your license.

By request of the Commissioner of Health of the Commonwealth of Pennsylvania and by order of the Board of Health of the city of Erie, Pennsylvania.

J. W. WRIGHT,
Health Officer."

The action of the State Department is not to be considered as a reflection on the local authorities. The Board had the milk situation in hand as well as could have been expected with the force of inspectors at their command. On January 26th, before the State was called in, the following personal notices had been sent out to dealers in milk.

"OFFICE OF THE BOARD OF HEALTH.

"Erie, Pa., January 26, 1911.

"Dear Sir:—Your attention is hereby called to Section 16 of the Rules and Regulations of the Board of Health governing the 'Production, Care and Sale of Milk and Cream,' the provisions of which must be followed to the letter, or your license will be revoked without further notice from this office.

"Your attention is further called to Section 18 of the aforesaid regulations relative to the removal of cans, bottles and other containers from houses under quarantine. Said rule in this connection, applying to cases of typhoid fever. No bottles or other containers are to be taken from premises where this disease exists, until the same have been thoroughly disinfected by this department.

"Peddlers delivering loose milk must be strictly cautioned to pour same into the container furnished by the householder, without in any way coming in contact with it.

"By order of the Board of Health.

"C. E. WELSH, Secretary."

"THE BOARD OF HEALTH

"Erie, Pa., January 26th, 1911.

"Dear Sir:—

"Please furnish this office, within five days from the above date, by mail or otherwise, names and R. F. D. addresses of all persons from whom you obtain milk and cream. You are also directed to notify this office, at once, in the event of any change being made in the sources of your milk and cream supply. In replying, give your name and license number.

"By order of the Board of Health,

"Very truly yours,

"C. E. WELSH,
"Secretary."

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h.—Licensed Store Dealers in Milk.

In table XXXVI appear data concerning typhoid cases among milk patrons of licensed stores. Thus it may be seen that in four instances only were there two cases among the patrons and in all other instances but one case. This result may be considered as evidence of the effectiveness of the order temporarily stopping the delivery of milk in bottles with the attendant elimination of the dangers hereinbefore described of the spread of typhoid fever through the agency of milk:

TABLE XXXVI.—TYPHOID CASES AMONG MILK PATRONS OF LICENSED STORES.

Store Proprietor.	People supplied.			Cases typhoid.	
	Families or customers.	Approximate number of individuals.	Milk in quarts daily.	Among patrons.	Individuals to each case.
1. Burling,	25	100	22	1	100
2. Beiber,	10	40	7	1	40
3. Buoy,	40	160	35	1	160
4. Cummings,	12	48	10	2	24
5. Comstock,	....	....	....	1	....
6. Drynuska,	8	32	5	1	32
7. Deibler,	....	....	....	1	....
8. Foutrick,	....	....	....	1	....
9. Grahata,	20	80	20	2	40
10. Graehl,	....	....	....	1	....
11. Gross,	....	....	....	1	....
12. Hoffman,	....	....	....	1	....
13. Hick Ice Cream,	Trasient	....	40	1	....
14. Isert,	20	80	18	1	80
15. Cavanaugh,	....	....	....	1	....
16. Kasznareck,	....	....	....	1	....
17. Kowalski,	....	....	....	1	....
18. Ledone,	8	32	5	2	16
19. Lesher,	....	....	....	1	....
20. Menniui,	12	48	12	2	24
21. McCarty,	12	48	20	1	48
22. Morgan,	25	100	22	1	100

TABLE XXXVI.—TYPHOID CASES AMONG MILK PATRONS OF LICENSED STORES—Continued.

Store Proprietor.	People supplied.		Milk in quarts daily.	Cases Typhoid.	
	Families or customers.	Approximate number of individuals.		Among patrons.	Individuals to each case.
23. Mitzentage,	....	....	....	1	....
24. Peswialowski,	....	....	....	1	....
25. Pulakos,	....	....	....	1	....
26. Robagkiewicz,	....	....	....	1	....
27. Sullivan,	....	....	....	1	....
28. Ostelle,	....	....	....	1	....
29. Sulke,	6	24	4	1	24
30. Semanowicy,	20	80	12	1	80
31. Sturgess,	....	....	....	1	....
32. Store,	....	....	....	1	....
33. Thompson,	5	20	10	1	20
34. Tate,	....	....	....	1	....
35. Welsch,	....	....	....	1	....
36. Way,	15	60	12	1	60
37. Watson,	....	....	....	1	....
38. Young,	12	48	12	1	48
	....	....	....	42	....

i.—Board of Health Rules and Regulations Concerning Production, Care and Sale of Milk.

For the benefit of the student of public health matters interested in the economy safeguarded to a community by the maintenance of high standards of sanitation, who may be searching for special cases which emphasize the economy, it may be well to offer the opinion held by the State Department of Health that in absence of the efficient rules and regulations regarding the milk supply of Erie, and the enforcement of them to a higher degree than is customary in the majority of the municipalities, there would have been added to the number of cases and deaths during the Erie epidemic a very considerable increase. For the purpose of general information, the said rules and regulations, the forms of applications, contracts and licenses and reports are as follows:

RULES AND REGULATIONS OF THE CITY BOARD OF HEALTH REVISED APRIL 1906.

Inspector of Foods (a).

(a) So amended Nov. 7, 1901, page 83 of Health Record. See Health Department Ordinances, par 63-4.

25. Sec. 1. The Inspector of Food shall inspect all wagons and stores from which milk is sold in the city, and shall take samples of milk therefrom and procure an analysis of the same at least once a month

26. Sec. 2. He shall make monthly inspections of all wholesale and retail meat markets and slaughter houses in the city.

27. Sec. 3. He shall inspect all bakeries and bakers' wagons at such times as the Health Officer may direct.

28. Sec. 4. He shall sign all notices and certificates of inspection required by the rules and regulations governing food supplies.

Production, Care and Sale of Milk and Cream (b).

(b) Rules 88 to 112, inclusive were approved March 15, 1905, pages 99 to 101 of Health Record.

88. Sec. 1. No person or persons, firm or corporation, shall sell milk or cream in the City of Erie without first, annually before the first day of July, making application to the Board of Health, which application shall set forth his, her or their name or names, together with the location of their route or

place of business, and the name of the owner of and the location of the dairy from which they obtain said milk or cream, and such other information relating to the care of said dairy and the production and care of milk and cream as may be deemed necessary by said Board of Health. Said application to constitute an agreement between the applicant and the Board of Health for the faithful compliance with all the rules and regulations of said Board. And obtaining from the Board of Health a license to carry on such business, which license shall be displayed in every store or wagon from which said milk or cream is sold.

89. Sec. 2. Each and every person or persons peddling milk or cream in the City of Erie, shall have the wagon or other vehicle from which milk or cream is sold, enclosed and conspicously marked in plain letters not less than three (3) inches high, with his, her or their name or names and the number of the license under which said milk or cream is sold.

90. Sec. 3. No milk or cream shall be sold, offered for sale or distributed in the City of Erie, unless each and every animal in the herds from which said milk or cream is obtained shall have been examined with one (1) year, to the satisfaction of the Board of Health, by a veterinarian or other inspector approved by said Board, such examinations to include the tuberculin test, when such test may be deemed advisable or necessary by the Board of Health, and said veterinarian shall furnish to the owner or owners of said herds a certificate, on blanks to be furnished by the Board of Health, which certificate shall be sworn and subscribed to before a duly authorized magistrate.

91. Sec. 4. No person or persons, firm or corporation, shall offer or expose for sale, sell or have in their possession with intent to sell in the City of Erie, any milk or cream, buttermilk or skimmed milk, to which has been added borax, boracic acid, salicylate of soda, benzoate of soda, sulphite of soda, formalin or formaldehyde or any other chemical, compound or foreign substances whatsoever, including ice or water. The percentage of fats in milk not to be less than three (3) per cent., and that of cream not less than fifteen (15) per cent., and vessels or cans containing buttermilk or skimmed milk must be plainly labeled as such.

92. Sec. 5. No milk or cream shall be sold or handled by any person or persons in whose family or residence there is a case of contagious or infectious disease, nor from any dairy or premises on which such diseases exist, except by permission of, and in the manner prescribed by the Board of Health.

93. Sec. 6. No milk or cream shall be sold or exposed for sale in the City of Erie except from cows stabled under light, dry and well ventilated conditions and in all other respects conforming to the requirements set forth in the following rules:

94. Rule 1. Each cow shall have at least three (3) feet in width of floor space when fastened in stanchions, and in all cases where no adequate artificial means for ventilation are provided, each animal shall have an air space of at least five hundred (500) cubic feet.

95. Rule 2. All stables for shelter of said cattle shall be provided with a tight, dry floor. The manure drop shall be water tight, and if constructed of wood, shall be asphalted, tarred or otherwise made non-absorbent.

96. Rule 3. The walls and ceilings of said stables shall be whitewashed whenever it may be deemed necessary by the Board of Health.

97. Rule 4. Manure shall not be allowed to accumulate in large quantities in stable yards, nor near the buildings where the cattle are kept and when stored temporarily in such places it shall be removed at least once a week to a distance of at least ten (10) feet from said stable. The stable yards shall be drained and kept in a clean, dry condition, and no accumulation of household garbage, vegetable or other putrescible matter shall be allowed to remain, or decay, in said stable yards.

98. Rule 5. Cattle shall at all times be kept in a clean condition, and the udders shall be wiped dry and clean with a clean damp cloth before each milking.

99. Rule 6. No milk or cream shall be sold or offered for sale, or distributed, in the City of Erie, obtained from any cow that has calved within five (5) days, or from a cow which will calve within twenty-one (21) days.

100. Sec. 7. No milk or cream shall be sold or exposed for sale in the City of Erie, except from cattle fed and watered under proper sanitary conditions, and all food given shall be good and wholesome and the water supply pure and free from all contamination by stable or household drainage.

101. Sec. 8. All milkers and other attendants employed in any dairy, the milk or cream from which is sold or offered for sale, or delivered in the City of Erie, shall be personally clean and healthy, and before milking or caring for the milk or cream, their hands shall be washed and their clothes changed and a clean suit, to be used for this purpose only, shall be put on and worn during milking time.

102. Sec. 9. All milk pails, cans and other receptables used for the production and transportation of milk or cream shall, before each use, be thoroughly washed with water and soap, or soda, and then scalded with boiling water or live steam, thoroughly aired and kept upside down in a cool place and they must not, under any circumstances, be rinsed with cold water before using.

103. Sec. 10. No milk or cream shall be kept for sale or distribution or handled, transferred to or from cans or bottles or stored, in any stable or similar place, or in any room used wholly or in part for domestic or sleeping purposes.

104. Sec. 11. Milk or cream shall be stored or regularly mixed, cooled or poured from cans only in a room not directly connected with a stable or stables, provided with a tight floor, and kept constantly neat and clean, the walls of the room being of such a nature as to allow easy and thorough cleaning.

105. Sec. 12. No water closet or privy shall be in the aforesaid room nor in any room connected directly therewith, nor shall dogs or cats or other domestic animals be allowed in these rooms at any time.

106. Sec. 13. Whenever milk or cream is filtered or strained, cooled or stored in a room, said room shall be such as is described in sections 10 and 11.

107. Sec. 14. Milk or cream kept for sale in any store, shop, market, bakery or other establishment shall be always kept in a covered cooled box or refrigerator properly drained and oared for and while therein shall be tightly covered or closed, and only in such location and under such conditions as shall be approved by the Board of Health.

108. Sec. 15. All vehicles from which milk or cream is sold in this city shall, during the months of June, July, August and September, be equipped with ice boxes which shall be of sufficient size and kept thoroughly clean, and when said vehicles are in use, shall be kept full of ice, and the temperature of said milk or cream shall at all times be kept at or below fifty (50) degrees Fahrenheit during the whole year.

109. Sec. 16. All cans, bottles or vessels of any sort used in the sale, delivery or distribution of milk or cream to the consumer must be cleaned and sterilized (boiled, baked, scalded or steamed) by the dealer before they are again used for the same purpose, and bottles must not be filled with milk or cream except at the dairy or milk depot from which distribution is made.

110. Section 17. No metallic or card tickets shall be used in connection with the sale or distribution of milk or cream in the city of Erie, but instead thereof a coupon ticket shall be employed, and such ticket shall be cancelled and destroyed after being once used.

111. Section 18. Under no circumstances shall a milk or cream dealer in the city of Erie, or his or her employes, take from a quarantined house any money, tickets, cans, bottles, etc., or enter such a house for any purpose whatsoever without written permission from the Board of Health.

112. All previous rules and regulations of the Board of Health governing the production and sale of milk and cream are hereby repealed.

It is to be noted that the sale of milk or cream in the city is regulated by requiring several things as follows:

1st, annual application
 giving name of applicant
 giving location of place of busniess
 giving location of route
 giving name of owner of dairy producing milk or cream
 giving location of said dairy
 giving other information relating to care
 giving other information relating to production.
2nd, the license is an agreement between city and applicant.
3rd, display of license in store required
 display of license on wagon required.
4th, peddlers of milk or cream shall have closed wagon or other vehicle. Vehicle to be conspicuously marked with:
  Name
  No. of license.

5th, No milk or cream to be sold, offered for sale or distribution { Unless each animal in herd has been been examined within 1 year to satisfaction of Board of Health.

Examination by a veterinarian or other inspector to be approved by Board of Health.
Examination to include tuberculin test when necessary.
Certificate to be issued to owner of herd by veterinarian.
Certificate must be sworn to.
The application to sell milk in Erie is as follows:

APPLICATION FOR MILK LICENSE FOR STORE OR DEPOT.

THE BOARD OF HEALTH.

Erie, Pa., ...19..

I hereby make application for permission to sell milk and cream in the City of Erie, subject to the Rules and Regulations of your Board, and the several Acts of Assembly governing the sale of milk and cream.

I obtain the milk and cream which I desire to sell from ....

....

whose dairies are located in ....

The number of quarts of whole milk which I sell on an average daily is ....

The number of quarts of cream which I sell on an average daily is ....

....

The number of quarts of skim milk which I sell on an average daily is, ...

....

There are no cases of typhoid fever, consumption, diphtheria, scarlet fever, smallpox, or other communicable diseases of any kind whatsoever, in my house, family, or among my employees, and in case of the appearance of any such disease in any of the said families or places, I will immediately make a written report thereof to the Secretary of your Board.

I will neither sell, nor keep for sale, any milk or cream except the same shall be in air and dirt proof containers, the use of which has been approved by the Board of Health, and which shall have been received by me properly sealed and filled, said seal to remain unbroken until the contents shall be sold.

I hereby give permision to the Board of Health, or its authorized agents, to enter my place of business at such times as they may desire, to examine the manner in which milk and cream is handled, and to take samples of the same.

I hereby agree to faithfully comply with the Rules and Regulations of the Board of Health governing the sale of milk and cream, and also agree that the said Board of Health may at any time revoke the license of which this application forms a part, for any failure on my part to fully conform with the requirements of said Rules and Regulations.

Name, ...

Place of Business, ...

Sworn and subscribed before me this....................day of...................19..

....

Secretary Board of Health.

It will be noted that the applicant states where product is obtained and where product is produced and the average daily quarts sold.

He is pledged to report appearance of diseases in his house family or among employees.

In addition to the veterinarian inspection, the Board of Health has a sanitary inspection made by an officer duly qualified for the purpose. He investigates the farm of any one producing milk or cream supplied to Erie and he also inspects the city milk depots and stores and wagons and scores the same on cards supplied for the purpose. The rating is given annually in the report of the Board of Health to City Councils.

The following cards show how this rating is done:

SANITARY INSPECTION OF DAIRY.

DAIRY SCORE CARD.

Owner of farm, ...
P. O. Address, ...
Lessee of Farm, ...
P. O. Address, ...
Total number of cows ....Number Milking ....
Quarts of milk produced daily, ...
Quarts of cream produced daily, ...
Product retailed by producer in, ...
Sold at wholesale to, ...
Date of inspection, ...191..
Remarks, ...
....
....

(Signed)

..........................Inspector.

DETAILED SCORE.

Methods.	Score.	
	Perfect.	Allowed.
Cows.		
Health, ...	6	......
Apparently in good health, ..1		
If tested with tuberculin once a year and no tuberculosis is found or if tested once in six months and all reacting animals removed, ...5		
(If tested only once a year and reacting animals found and removed, 2), ...		
Comfort, ...	2	......
Bedding, ...1		
Temperature of stable, ...1		
Food (clean and wholesome) ,....	2	......
Water, ...	2	......
Clean and fresh, ...1		
Convenient and abundant, ...1		
Stables.		
Location of stable, ...	2	......
Well drained, ... 1		
Free from contaminating surroundings, ...1		
Construction of stable, ...	4	......
Tight, sound floor and proper gutter, ...2		
Smooth, tight walls and ceiling, ...1		
Proper stall, tie and manger, 1		
Light: Four sq. ft. of glass per cow, ...	4	......
(Three sq. ft., 3: 2 sq. ft., 2; 1 sq. ft., 1. Deduct for uneven distribution.)		
Ventilation: Automatic system,	3	......
(Adjustable windows, 1)		
Cubic feet of space for cow for cow: 500 to 1,000 ft., ...	3	......
(Less than 500 feet, 2; less than 400 feet, 1; less than 300 feet, 0).		
Utensils.		
Construction and condition of untensils, ...	1	......
Water for cleaning, ...	1	......
(Clean, convenient, and abundant.)		
Small top milking pail, ...	3	......
Facilities for hot water or steam	1	......
(Should be in milk house not in kitchen.)		
Milk cooler, ...	1	......
Clean milking suits, ...	1	......
Milk Room.		
Location of milk room, ...	2	......
Free from contaminating sur roundings, ...1		
Convenient, ...1		
Construction of milk, ...	2	......
Floor, walls, and ceiling, ...1		
Light, ventilation, screens, ..1		
Total, ...	40	......

Equipment.	Score.	
	Perfect.	Allowed.
Cows.		
Cleanliness of cows, ...	8	......
Stables.		
Cleanliness of stables, ...	6	......
Floor, ...2		
Walls, ...1		
Ceiling and ledges, ...1		
Mangers and partitions, ...1		
Windows, ...1		
Stable air at milking time, ...	6	......
Barnyard clean and well drained	2	......
Removal of manure daily to field or proper pit, ...	2	......
(To 50 feet from stable, ...1)		
Milk Room.		
Cleanliness of milk room, ...	3	......
Utensils and Milking		
Care and cleanliness of utensils,	8	......
Thoroughly washed and sterilized in live steam for 30 minutes, ...5		
(Thoroughly washed and placed over steam jet, 4; thoroughly washed and scalded with boiling water, 3.)		
(Thoroughly washed, not scalded, 2.)		
Inverted in pure air, ...3		
Cleanliness of milking, ...	9	......
Clean dry hands, ...3		
Udders washed and dried, ...6		
(Udders cleaned with moist cloth, 4; cleaned with dry cloth at least 15 minutes before milking, 1.)		
Handling of Milk.		
Cleanliness of attendants, ...	1	......
Milk removed immediately from stable, ...	2	......
Prompt cooling. (Cooled immediately after milking each cow	2	......
Efficient cooling; below 50°F., ...	5	......
(51° to 55°, 4; 56° to 60, 2.)		
Storage; below 50°F., ...	3	......
(51° to 55°, 2; 56° to 60°, 1.)		
Transportation; iced, ...	3	......
(For jacket or wet blanket allow 2; dry blanket or covered wagon, 1.)		
Total, ...	60	......

Score for equipment + score for methods = final score.

Note 1.—If any filthy condition is found, particularly dirty utensils, the total score shall be limited to 49.

Note 2.—If the water is exposed to dangerous contamination or there is evidence of the presence of a dangerous disease in animals or attendants, the score shall be 0.

The application to peddle milk in Erie is as follows:

APPLICATION FOR MILK LICENSE FOR WAGON OR VENDOR.

THE BOARD OF HEALTH.

Erie, Pa., ...19..

I hereby make application for permission to sell milk and cream in the City of Erie, subject to the Rules and Regulations of your Board, and the several Acts of Assembly governing the sale of milk and cream.

The dairies from which I obtain milk are located in ....
.... Township,
and are owned by ....
....

The number of cows from which said milk is obtained is ....

The number of quarts of whole milk which I sell on an average daily is ....

The number of quarts of cream which I sell on an average daily is ....

The number of quarts of skim milk which I sell on an average daily is ....

Each animal in the herd or herds from which said milk or cream is obtained, has been examined during the present calendar year by ....D. V. S., the certificate of which, as filed by him, I hereby accept as a part of this application. There are at the present time, no diseased or injured animals in the said herd or herds, and, in the event of the occurrence of any such disease or injuries, I will at once notify the Secretary of your Board, said notification to be in writing.

There are no cases of typhoid fever, consumption, diphtheria, scarlet fever, smallpox, or other communicable diseases of any kind whatsoever, in my house, family, or among my employees, or in the house, family, or among the employees of the owner of the dairy or dairies from which said milk or cream is obtained; and in the event of the appearance in any of the said families of any of the above mentioned diseases, I will immediately make a written report thereof to the Secretary of your Board.

I hereby give permission to any person or persons in the employ of the Board of Health to visit, at any time, my premises, or any premises from which said milk or cream is obtained, for the purpose of inspecting the cows, stables, milk houses, food and water supply, and obtaining such other information relating to the care of said herds and the milk supply, as may be deemed necessary by the said Board of Health. They may also take samples of milk and cream from said dairies or wagons at such times and places as they may desire.

I hereby agree to faithfully comply with the Rules and Regulations of the Board of Health governing the sale of milk and cream, and also agree that the said Board of Health may at any time revoke the license of which this application forms a part, for any failure on my part to fully conform with the requirements of said Rules and Regulations.

Name ....
Residence ....
Sworn and subscribed before me this ....day of................19..

....
Secretary Board of Health.

It will be noted that the applicant tells where product is obtained, owner of dairies and number of cows and quarts daily sold, and

Must swear he has certificate of herd and pledges to report occurrence of any disease in herd.

He swears that there is no disease in his house, family, among employees, or in those of owner of dairy or dairies from which milk is obtained.

He promises to report any occurrence of such.

The veterinarian's examination is made annually, or in case of reported sickness in the herd, as frequently as required. His certificate of examination is as follows:

VETERINARIAN'S REPORT.

..................................19..

To the Board of Health, Erie, Pa.

Gentlemen:—This is to certify that I have examined the herd of ....
milch cows on the premises of ....occupied by................
and located in the Township of..................County of.......................,
State of ....on the..................day of......................19..

and found the said herd to be free from all diseases whatsoever, except as follows:

....

The tuberculin test { *was.................................... was not...................................

I also certify that the sanitary condition of the premises, including stable, milk house, yard, etc., is *poor, fair, good, excellent.

*Erase terms not used.

Very respectfully,

..........................Veterinary Surgeon.

State of ....
County of .... } ss.

........................the above named, being duly sworn according to law, deposes and says that the facts set forth in the foregoing certificate are true and correct to the best of his knowledge, information and belief.

Sworn and subscribed before me this ....day of ....19..

....

Veterinarians will return this certificate to the office of the Board of Health, Erie, Pa., either in person or by mail.

The license used by the Board of Health that establishes the dealer in business for one year is as follows:

MILK DEALERS' LICENSE.

No......

OFFICE OF THE BOARD OF HEALTH OF THE CITY OF ERIE.

THIS IS TO CERTIFY, That ....

is hereby licensed to sell Milk and Cream within the limits of the City of Erie,

from a ....from July 1, 19.... ,to June 30, 19....,

inclusive.

This license is issued in accordance with the Rules and Regulations of the Board of Health and may be revoked at any time for failure to comply therewith.

Given under the seal of the Board of Health this................day of............

19...

..........................M. D.
Health Officer.

....
Secretary.

N. B.—This license must be displayed in every wagon and store from which milk or cream is sold.

SANITARY INSPECTION OF CITY MILK DEPOTS AND STORES.

Owner or Manager, ...

Trade Name, ...

City, ... Street and No. .... State,..................

Number of wagons .... Gallons sold daily, Milk .... Cream ....

Permit or license No., ... Date of inspection, ... 19........

SCORE.

	Perfect:	Allowed.	REMARKS.
MILK ROOM.			
Location,	10		
Construction:	10		
Floor (3),			
Walls and Ceiling (3),			
Drainage (4),			
Cleanliness,	15		
Light and ventilation,	10		
Equipment:	15		
Arrangement (3),			
Construction:			
Sanitary, (2),			
Durability (2),			
Condition (3),			
Cleanliness (5),			
MILK.	20		
Handling (12),			
Storage (8),			
SALES ROOM.	10		
Location (2),			
Construction (2),			
Equipment (2),			
Cleanliness (4),			
Attendants,			
WAGONS.	10		
General appearance (2),			
Protection of product (3),			
Cleanliness (5),			
Attendants,			
Total,	100		
STORES.			
Cleanliness,	3		
Equipment,	15		
Attendants,	2–20		

Sanitary conditions are excellent, ...Good............Fair............Poor............

Suggestions by Inspector, ...

(Signed) ....
Inspector

DIRECTIONS FOR SCORING.

MILK ROOM.

LOCATION.—If not connected by door with any other building, and surroundings are good, 10; when connected with other rooms, such as kitchens, stables, etc., make deductions according to conditions.

CONSTRUCTION.—If good cement floor, and tight, smooth walls and ceiling, and good drainage, allow 10; deduct for cracked or decayed floors, imperfect walls and ceiling, etc.

CLEANLINESS.—If perfectly clean throughout, allow 15; deduct for bad odors, unclean floor and walls, cobwebs, unnecessary articles stored in room, etc.

LIGHT AND VENTILATION.—If window space is equivalent to 15 per cent. or more of floor space, allow 5; deduct 1 for every 3 per cent. less than the above amount.

EQUIPMENT, ARRANGEMENT.—Allow 3 points for good arrangement; if some of the equipment is out of doors or so placed that it cannot be readily cleaned, make deductions according to circumstances.

CONDITION.—If in good repair, allow 4 points; make deductions for rusty, worn out or damaged apparatus.

CONSTRUCTION, SANITARY.—If seams are smooth and all parts can be readily cleaned, allow 2; deduct for poor construction, from sanitary standpoint.

DURABILITY.—If made strong and of good material, allow 2; deduct for light construction and poor material.

CLEANLINESS.—If perfectly clean, allow 8 points; make deductions according to amount of apparatus improperly cleaned.

MILK.

HANDLING.—If milk is promptly cooled 50° F. or lower, allow 12 points; or if pasteurized at a temperature 140° F. or above and promptly cooled to 50° or lower, allow 12 points. Deduct 1 point for every 2 above 50° if milk is pasteurized imperfectly, deduct 6 points. If milk is improperly bottled or otherwise poorly handled, make deductions accordingly.

STORAGE.—If stored at a temperature of 45° F. or below, allow 8 points. Deduct 1 point for every 2 above 45°.

SALES ROOM.

LOCATION.—If exterior surroundings are good and building is not connected with any other under undesirable conditions, allow 2; for fair conditions allow 1; poor conditions, 0.

CONSTRUCTION.—If constructed of material that can be kept clean and sanitary, allow 2; for fair construction, allow 1; poor construction, 0.

EQUIPMENT.—If well equipped with everything necessary for the trade, allow 2; fair equipment, 1; poor equipment, 0.

CLEANLINESS.—If perfectly clean, allow 2 points; if conditions are good, 1; poor, 0.

ATTENDANTS.—Healthy, 2; allow 1; poor, 0.

WAGONS.

GENERAL APPEARANCE.—If painted and in good repair, allow 2 points; for fair condition, 1; poor, 0.

PROTECTION.—If product is iced, allow 3 points; well protected but not iced, 1; no protection, 0.

CLEANLINESS.—If perfectly clean, allow 3 points; good, 2; fair, 1; poor, 0.

ATTENDANT.—Healthy, 2; unhealthy, 0.

STORES.

CLEANLINESS.—Thoroughly clean, allow 3; good, allow 2; fair, allow 1; poor, allow 0.

EQUIPMENT.—If milk is sold in original packages, allow 5; if milk is sold from tightly covered container, allow 3; if no especial container is used, allow 0. If milk only is kept in ice box, allow 5; if other articles besides milk are kept in ice box; allow 2; no ice box, 0.

ATTENDANTS.—Healthy, allow 2; unhealthy, 0.

DEPARTMENT OF HEALTH.—ERIE, PA.,
REPORT OF MILK INSPECTION FOR THIS DAY OF ...., 19....

Date.	Name of Vendor.	No. License.	Name of Producer.	Sp. Gr.	Solids.	Fat.	Preservatives.	Remarks.

....Milk Inspector.

16.—GARBAGE, NIGHT SOIL AND GENERAL SANITATION.

The houses where typhoid fever occurred were carefully inspected by officers of the State Department of Heath and all insanitary conditions were reported to the city Health Officer. Ninety-six such dwellings were without sewer connection. Laundry water and kitchen drainage went out to the surface of the ground, usually in the yard; sometimes to the alley, gutter or public highway.

The dirty water from washed bed linen of the patient was often thrown on the garbage and rubbish pile. The State officer assisted the city officer in the cleaning up of the rubbish and garbage piles and in the disinfection of insanitary premises. Some of the dwellings were not fit habitations and they were ordered abandoned. Lime was distributed freely.

It was not so difficult for the local authorities assisted by the State authorities, to clean up ordinary rubbish heaps; but the removal and disposal of garbage was another matter.

On March 10th, the Commissioner of Health sent the following communuication to the Mayor and City Councils:

"To the Honorable, the Mayor and City Councils, Erie, Pa.

"Gentlemen:—We have evidence at hand that in certain districts of your city garbage has been polluted with typhoid infection. Unless this practice is stopped and this garbage is properly disposed of there will continue to be secondary cases of typhoid fever from this origin. Your present lax method of garbage collection and disposal permits the accumulation of house offal on private properties. It is very desirable that you should establish the proposed municipal collection of garbage at once, if not in whole, then for those parts of the city that are not reached under the existing system of fee collection, and I suggest for your consideration that this be done immediately and that the garbage collected by the city from these danger districts be disposed of by some approved method until the garbage crematory to be built by the city is ready for operation. This will materially aid the city board of health and reduce the danger of the spread of typhoid fever as warmer weather approaches.

"Proper facilities for the disposition of household drainage and sewage should be established without delay throughout the city. Where there is a sewer the city ordinance or board of health rule compelling a connection will be enforced by the officers of the health department of the city.

"Where there is no sewer, a permanent masonry receptacle for household drainage and night soil should be built under municipal regulation and the cleaning of these vaults and the disposition of the contents should also be under the strict supervision of the city. The putting of the expense upon the property owner should be a matter of careful consideration, but there should be no hesitancy in compelling the adoption of one or the other of these two methods of caring for household wastes. It is suggested that the proper committee of Department of the city take up jointly with the local board of health the consideration of this subject, to the end that a policy may be clearly defined and adopted to be followed during the current season.

"Yours truly,

(Signed) "SAMUEL G. DIXON."

Three hundred and twenty-five typhoid properties used outside privy vaults for the disposal of excrement. One hundred and eighty-nine of them were removed and the property disinfected and connected to the sewer system.

Neither garbage nor night soil is a likely medium through which typhoid fever infection may become widely spread throughout a large community; but they are dangerous media for the spread of the disease in the household or about the neighborhood and especially so during the progress of an epidemic. Filth and disease have a well established relationship. On general sanitary principles, garbage and night soil should be taken care of in a sanitary manner.

The city made extra appropriations for the spring clean-up. The State kept two of its sanitary officers in Erie to assist the local officers with the work. In table XXXVII is given the amount of work done during the first half of 1911; and the copies of published notices to property owners and owners of outdoor closets show the activity of the city health authorities.

TABLE XXXVII.

MUNICIPAL SANITARY WORK.

Month.	Nuisances Abated.	Insanitary.		Privies Removed.	Piles Removed	
		Houses.	Privies.		Garbage.	Rubbish.
1911:						
January,	84	19	65	....	20	23
February,	614	117	309	....	118	20
March,	767	28	415	87	158	41
April,	631	41	233	102	80	216
May,	2000	64	574	....	999	1261
June,	1498	17	328	....	341	1500
July,	2193	14	207	....	396	1403

"TO PROPERTY OWNERS AND TENANTS IN THE CITY OF ERIE.

"Erie, Pa., April 11, 1911.

"You are hereby notified to remove, within fifteen (15) days from this date, and to keep removed at all times hereafter, all accumulations of garbage, rubbish and other insanitary material from any premises owned or occupied by you in this city.

'You are also directed to properly enclose, within the same time, all manure heaps on your premises, making them vermin and fly proof, in the manner and form prescribed by the Health Department.

"In this connection, a substantial wire screen may be used instead of a close wooden cover.

"By order of the Board of Health.

"J. W. WRIGHT, M. D.,
"Health Officer."

"TO OWNER OF OUTDOOR CLOSETS.

"Erie, Pa., April 11, 1911.

"You are hereby notified that all outdoor closets on sewered streets must be properly connected with the street sewer, and the old vault limed and filled on or before June 1, 1911, and that all outdoor closets on unsewered streets must be constructed to conform with the regulation of the board of health governing this subject, within the same period, said rule reading as follows:

" 'Water closets, when located in yard, must be so arranged as to be conveniently and adequately flushed, and the water supply pipes and traps protected from freezing by being placed in a hopper-pit at least four feet below the surface of the ground, the walls of which pit shall be constructed of hard burned brick or stone, laid in cement mortar, or of concrete. The walls for pit, where one (1) closet is installed, may be four (4) inches in thickness; or salt-glazed sewer pipe, thirty-six (36) inches in diameter, may be used.

" 'Where pit is for more than one (1) closet, the walls shall be nine (9) inches in thickness. The soil pipe and traps used inside pit must be extra heavy cast iron, and the trap to have hand hole for cleanout purposes, with cleanout caulked in. If the closet is located in the rear of a soil or vent pipe, the drain on which it is located shall be vented with a four (4) inch pipe, carried above roof of closet, away from any opening or window. All outside closets shall be of the tank pattern. The water to be supplied to tank through an automatic seat action valve. The waste from valve may be permitted to discharge on cement floor of pit, which shall be provided with four-inch trap and strainer. The enclosure of yard water closets shall be ventilated by slatted openings, and there shall be a trap door of sufficient size to permit of convenient access to the hopper pit.

" 'No privy, vault or cesspool for sewage shall hereafter be constructed in any part of the city where a sewer is at all accessible, which shall be determined by the board or bureau of health; nor shall it be lawful to continue a privy vault or cesspool on any lot, piece or parcel of ground abutting on or contiguous to any public sewer, within the city limits. The board of health shall have the power to issue notice, giving at least three months' time to discontinue the use of any cesspool and have it cleaned and filled up. No connection for any cesspool or privy vault shall be made with any sewer; nor shall any water closet or house drain empty into a cesspool or privy vault.

" 'In districts where no sewer exists, privy vaults shall not be located within two feet of party or street line, nor within twenty feet of any building.

" 'Before any privy vault shall be constructed, application for permission therefor shall be made to the department or board or bureau of health; and such privy vault shall have nine-inch walls, constructed of hard burned brick or stone, laid in cement or mortar, or of concrete, with bottom and sides cemented so as to be water tight; size to be not less than four feet in diameter and six feet deep.'

"This is to be constructed as being a personal notice. Legal proceedings will be instituted against all persons failing to comply therewith, without further notice from this office.

"By order of the Board of Health.

"J. W. WRIGHT, M. D.,
"Health Officer."

PART IV. CAUSE OF THE EPIDEMIC.

1. Mr. G. R. Oberholzer's Investigation of Lake Currents.

The Board of Water Commissioners was at first strongly of the opinion that the outbreak of dysentery followed by typhoid fever was not due to water. The report of the three experts employed by this Board, before the State Department of Health came on the ground, was the first thing that shook said Board's confidence in the purity of the source of supply.

There were three places only where the pollution could have entered the water works system. One was the lake intake, the other the harbor emergency intake at Presque Isle and the third the old original intake which has since been closed up. The facts with respect to the last have been hereinbefore given which apparently eliminate this point from suspicion.

It can never be known positively whether the Presque Isle harbor emergency intake valve was tampered with or not. It might have been opened part way through mistake and the fact kept secret because of fear of consequences; but this does not seem probable to the Department. The probable cause was the sudden contamination by sewage of the water in the lake at the end of the 60 inch supply pipe. At the time no one thought this possible who had any connection with the city water works affairs. The U. S. Weather Bureau expert stationed in Erie was appealed to by the Chief Engineer of the Department, for an opinion as to the probability of lake currents carrying sewage from Erie harbor to the lake intake. This Federal expert studied the matter, his conclusions were reviewed and approved by Willis L. Moore, Chief of U. S. Weather Bureau and they show that such currents were the probable means of transmitting sewage pollution from Erie harbor to the lake intake at the two times corresponding and prior to the dysentery outbreaks and the typhoid epidemic. The report which was prepared especially to accompany the State Department of Health's discussion of the origin of the epidemic is as follows:

"Erie, Pa., February 7, 1911.

"Mr. G. R. Oberholzer, Local Forecaster,
"U. S. Weather Bureau,
"Government Building, Erie, Pa.

"Dear Sir:—Samples of water collected from the lake intake pipe at the manhole on Presque Isle by agents of the State Department of Health and analyzed by Department experts at the State Health laboratories, show the presence of sewage organisms in the water. This water is supplied to the public in Erie. The widespread distribution of typhoid fever cases throughout the city and the fact that no other medium of transmission of the disease seems probable, points to the lake and harbor water, as the suspicious cause of the outbreak.

"Is it possible in your opinion for lake currents under certain conditions to carry the water of the harbor out and around the peninsula to and beyond the point at which the lake water is drawn into the water works intake pipe and if so at what time or times since about the first of December or the last part of November up to the present time have the conditions of currents been such as to produce this result and what were the natural phenomena accompanying the conditions?

"Your opinion, based upon scientific data collected under your direction and on file in your bureau will be of great value in the study of the typhoid fever outbreak. I therefore respectfully request your full discussion of the questions asked and will if you favor us, transmit it with my report to Dr. Samuel G. Dixon, the Commissioner of Health of the Commonwealth of Pennsylvania.

"Yours truly,

"F. HERBERT SNOW,
"Chief Engineer, State Dept. of Health,
"Harrisburg, Penna."

U. S. DEPARTMENT OF AGRICULTURE,
LOCAL OFFICE OF THE WEATHER BUREAU,
Erie, Pa., February 28, 1911.

"Mr. F. Herbert Snow,"
"Chief Engineer, State Dept. of Health,"
Harrisburg, Pa.

"Dear Sir:—Referring to your letter of the 7th instant in which you point to the lake and harbor water as suspicious causes of the typhoid in this city, and request such data as may be at the disposal of this office, with a full discussion of the same, to the end that it may be established or disproved that polluted harbor water may possibly find its way into the water supplied to the city through the intake pipe laid into the lake, I have to say that a paper, with charts, has been prepared that, it is hoped, may be of some use in the present deplorable contingency here.

"This paper was submitted to the Chief of the Weather Bureau in accordance with our regulations, who, in returning it, writes as follows:

" 'Your conclusions as to the possible contamination of the water supply of the city of Erie under certain circumstances are apparently well grounded, and there is no objection on the part of this office to the publication of your papers.'

"The paper is inclosed herewith. If I can serve you further at any time it will please me to do so.

"Very respectfully,
"G. R. OBERHOLZER,
"Local Forecaster."

THE CURRENTS OF LAKE ERIE THE POSSIBLE CAUSE OF THE CONTAMINATION OF THE WATER SUPPLY OF THE CITY OF ERIE BY SEWAGE DISCHARGED INTO THE HARBOR.

BY

G. R. Oberholzer, Local Forecaster, U. S. Weather Bureau.

Reviewed by Professor Willis L. Moore, LL. D., Chief U. S. Weather Bureau, and finding approved.

"Fluctuations of the water level of Lake Erie," by Alfred J. Henry, Professor of Meteorology, was used in preparing the matter on the seiche, and Chart III was copied from that Bulletin. I am also indebted to the U. S. Engineer Office, Buffalo, N. Y., and to its local representative, Mr. Charles Reed for the data on lake levels, etc. Many fishermen and others who are familiar with the Lake courteously gave much valuable information.

Erie, Pennsylvania, February 18, 1911. G. R. O.

Lake Erie, the most southern and shallowest of the Great Lakes is about 250 miles long with a maximum width of 60 miles. Its total area is about 10,000 square miles. The boundary lines, as well as the contour of the bottom, are such that the lake is naturally divided into three sections, viz, the eastern, central, and western portions. The western section, lying west of the islands has so little significance as a separate division to the present inquiry that it will be considered a part of the central or main portion of the lake in this discussion. The portion east of the narrows, with an area of approximately 2,100 square miles, is an enlarged portion of ancient Lake Erie, which probably had an area not much more than 1,000 square miles. The low divide on the western shore of this ancient body of water can be discerned plainly by referring to the contour map, stretching across the lake bottom, about ten miles west of Erie. The drainage from the basin (or it may have been a shallow lake) to the westward, which comprises more than three-fourths of the present lake, together with the run off from its adjacent slopes, apparently eroded a channel through the divide about six miles northward from the southern shore of the present lake, and emptied into the old lake 8 or 10 miles north of Erie. This channel is so well defined to this day that fishermen call it the "Canal." It is slowly filling up with all sorts of debris; yet, even now, it averages 30 feet deeper than the water to the north and southward of it, has a width between its steeper slopes of about one and one-half miles, and is approximately 20 miles long. The eastern, or old portion of the lake, is 200 feet deep off Long Point, but the bottom slopes upward rapidly to the south-westward to about 50 feet on the old divide. and the lake narrows down to 28 miles between Long Point and Erie. The large western portion of the lake at its deepest, measures 85 feet. Reference to the longitudinal and cross sections of the lake (Chart II) illustrate these features, and

GENERAL CONTOUR CHART OF LAKE ERIE

FROM CHART BY U.S. ENGINEERS.

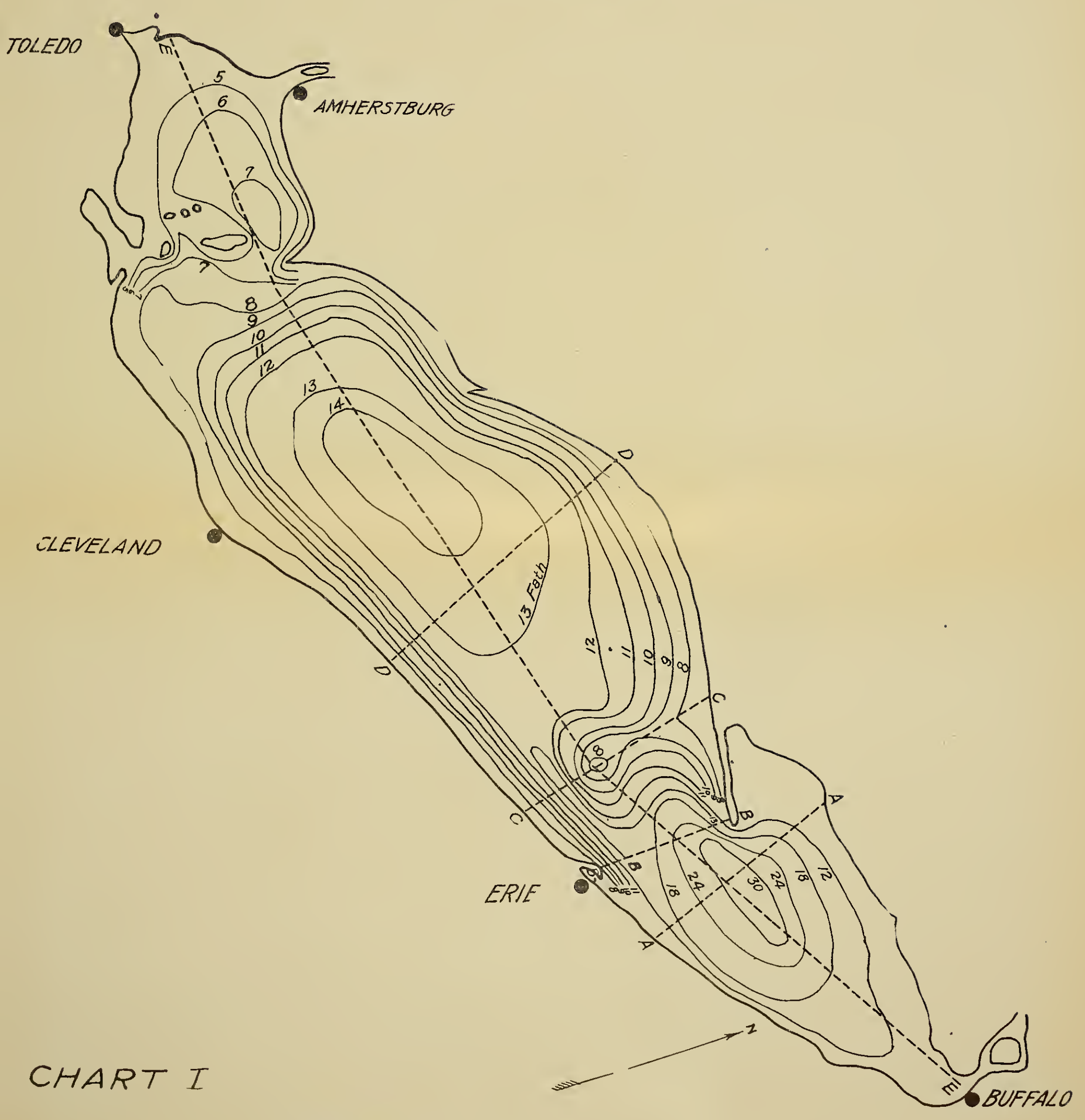
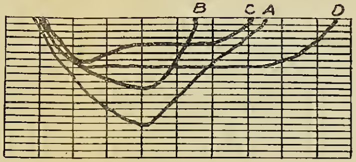


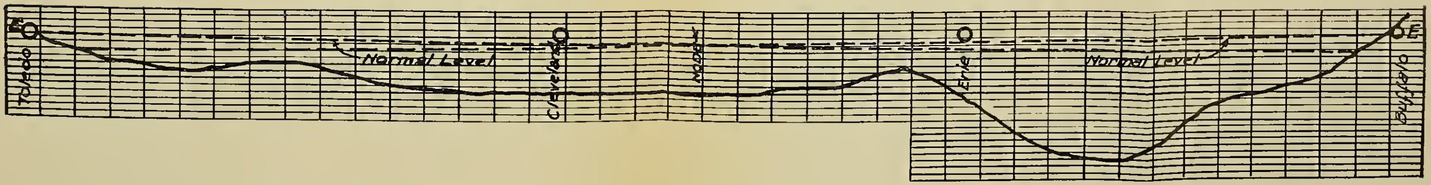
CHART I

CHART II

CROSS SECTIONS OF LAKE ERIE
ON LINES A, B, C & D, ON CHART I

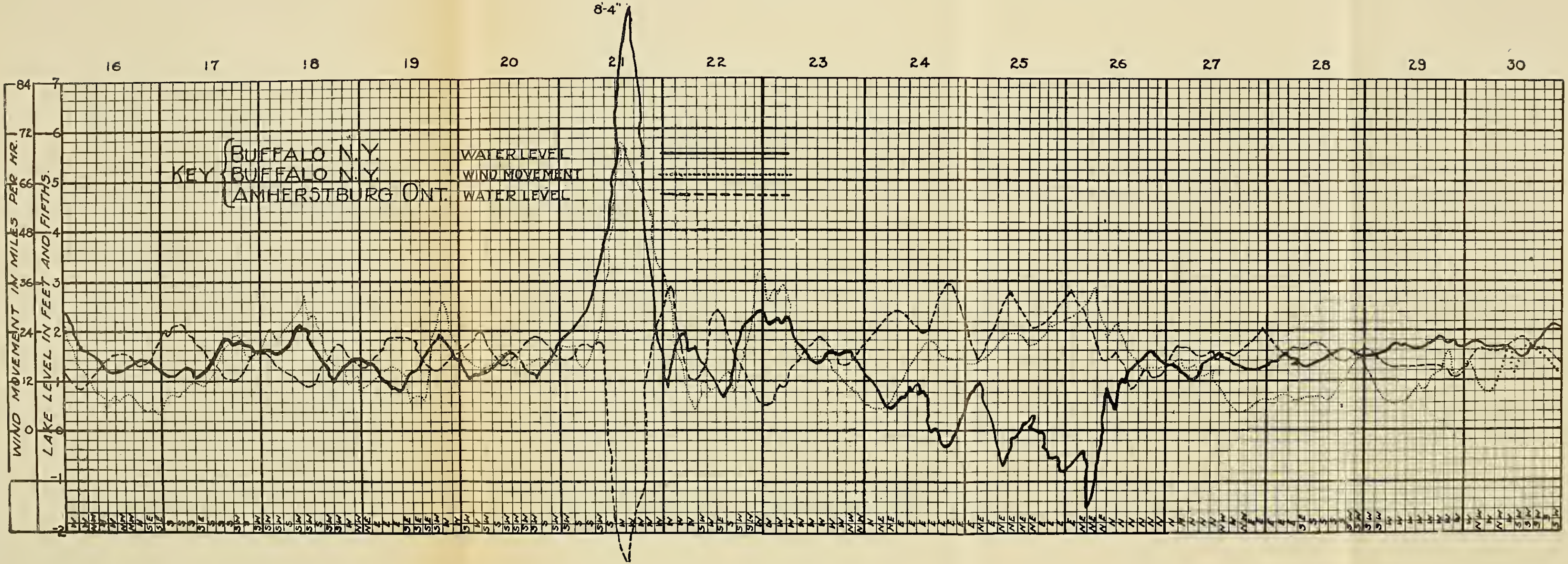


LONGITUDINAL SECTION OF LAKE ERIE.
ON LINE E, CHART I
Vertical Values Magnifed 560 Times



WIND VELOCITY AND WATER LEVEL FLUCTUATIONS ON LAKE ERIE
NOVEMBER 1900.

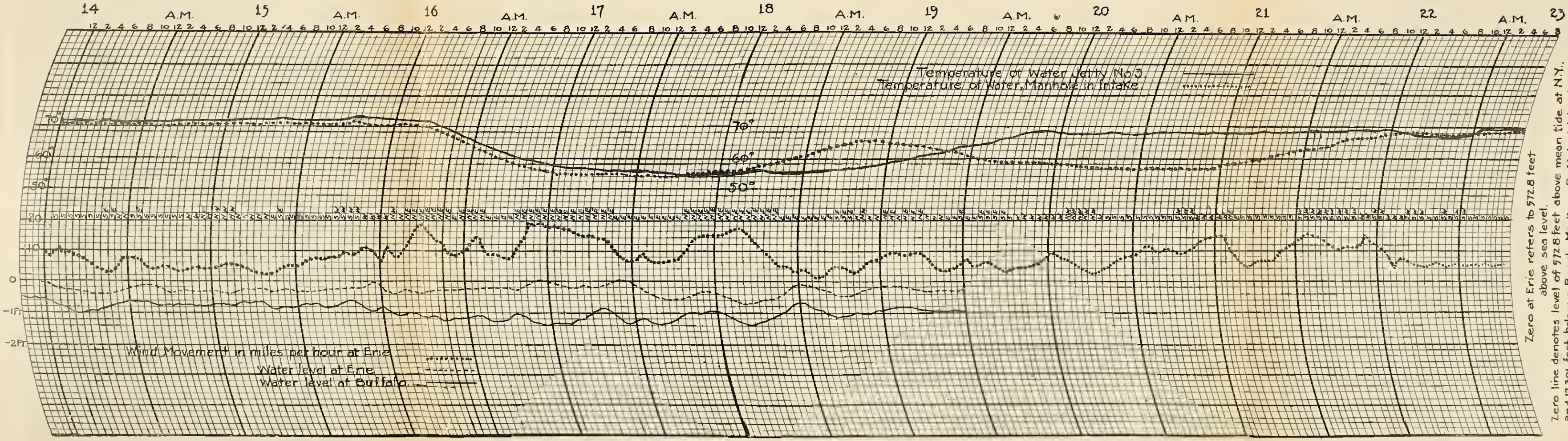
CHART III.



WATER LEVEL OF LAKE ERIE AT BUFFALO N.Y. and ERIE PA.

CHART IV.

JULY 1910



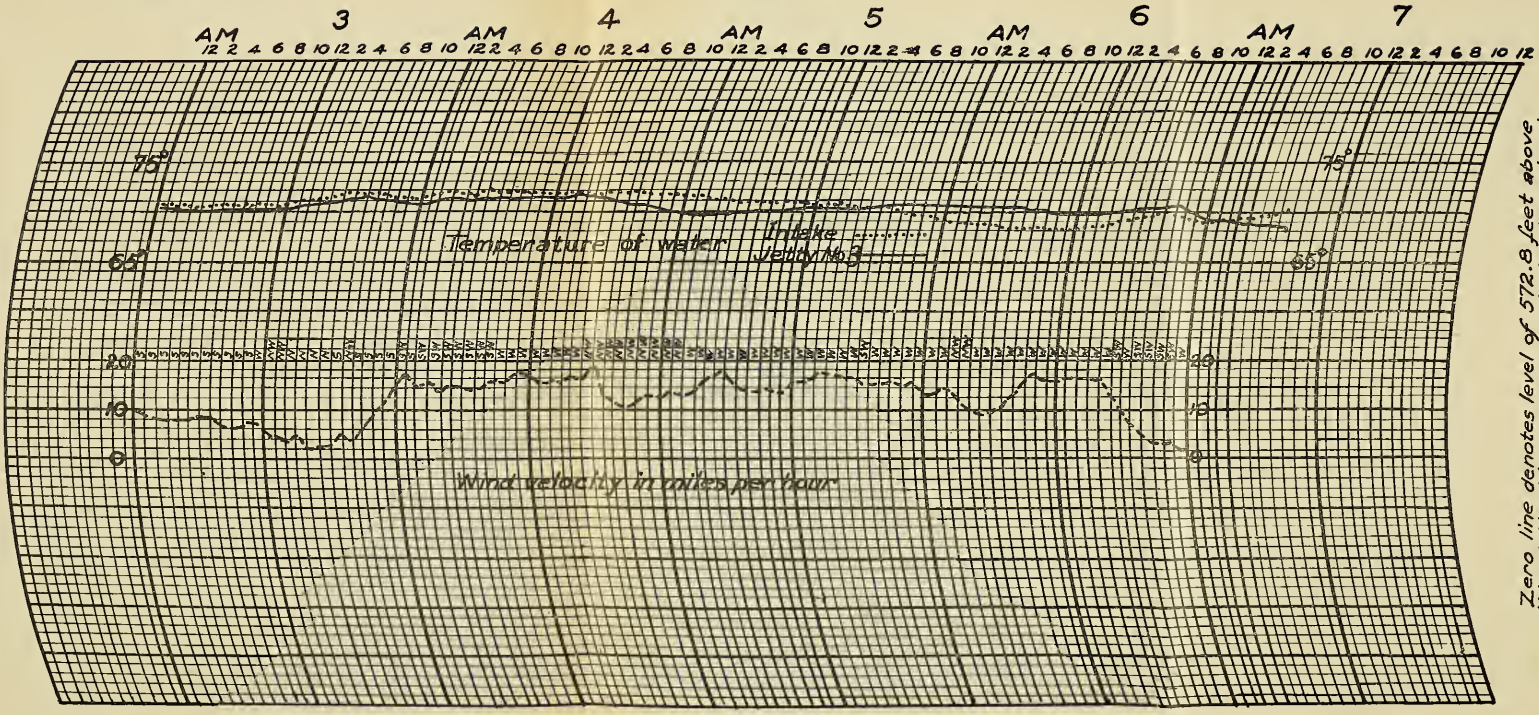
Zero at Erie refers to 572.8 feet above sea level.

Zero line denotes level of 572.8 feet above mean tide at N.Y., and 17,301 feet below a Bench Mark on Buffalo Light House, South Pier, Buffalo, N.Y. Zero of staff gauge denotes same level.

AUGUST 1910

INNER LIGHT HOUSE SLIP, SOUTH PIER.

CHART IV a

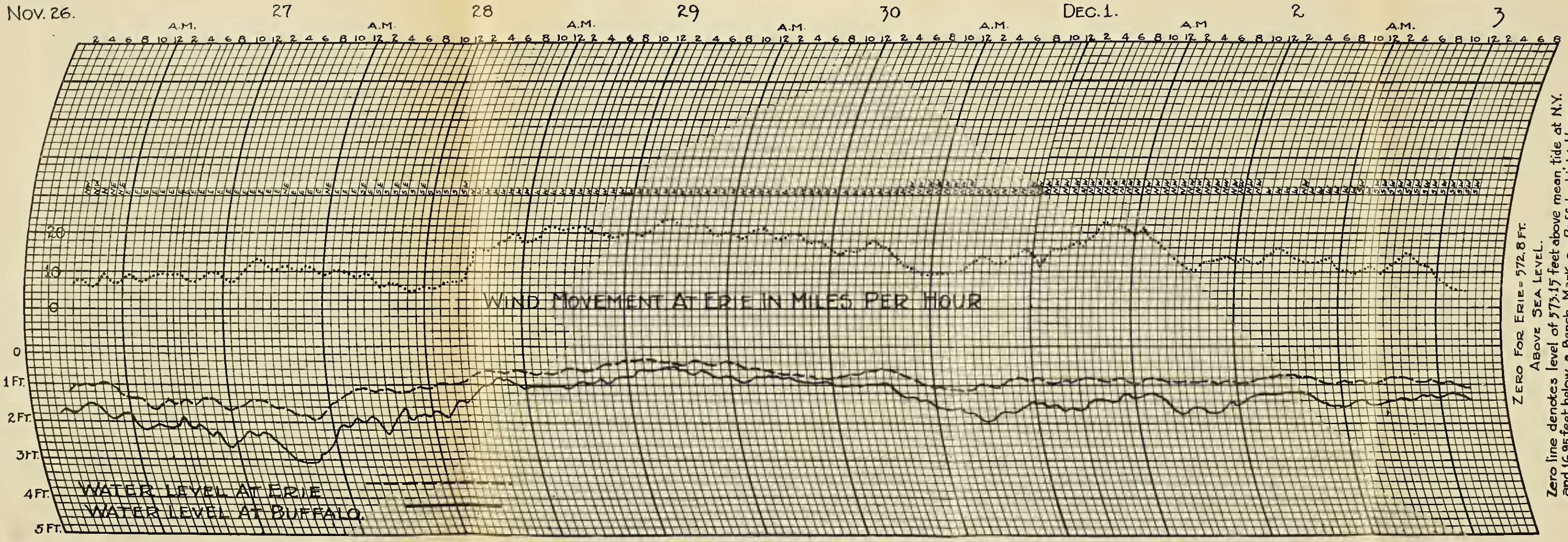


Zero line denotes level of 572.8 feet above mean tide at New York, and 17.501 feet below a bench mark on Buffalo Light House, South Pier, Buffalo, N.Y. Zero of staff gauges denotes same level.

WATER LEVEL OF LAKE ERIE AT BUFFALO N.Y. AND ERIE PA.

CHART V

Week Ending Dec. 3 1910.



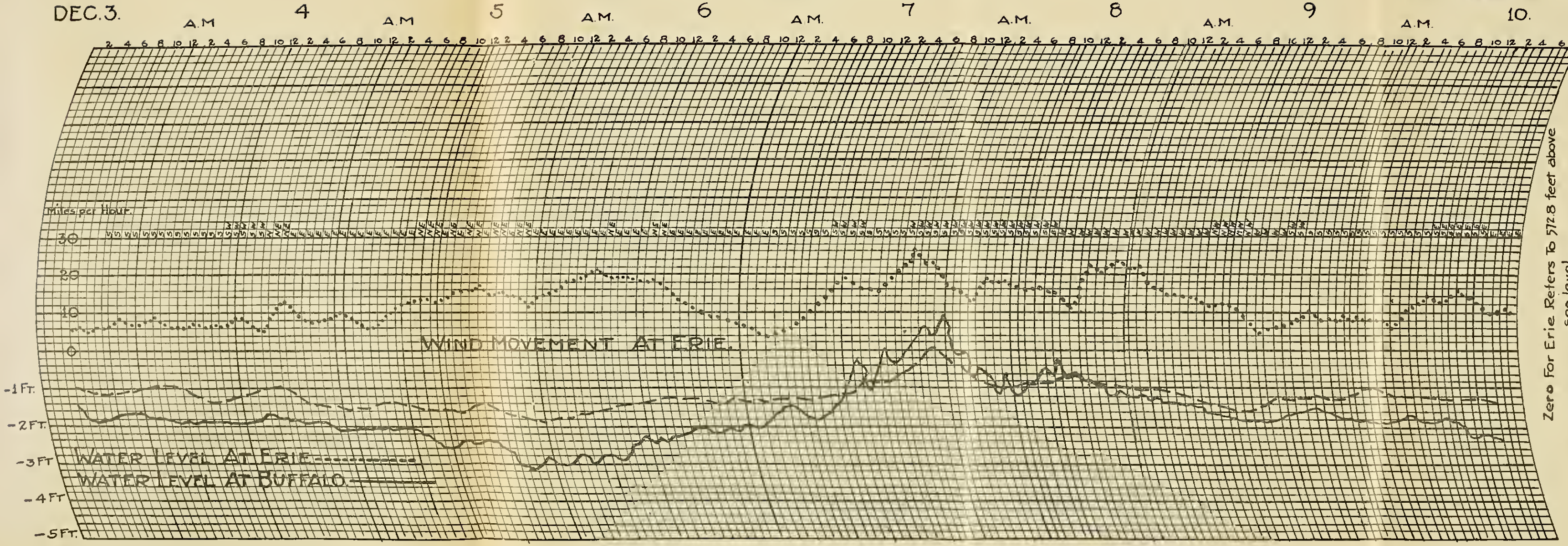
Zero For Erie = 572.8 Ft. Above Sea Level.

Zero line denotes level of 573.15 feet above mean tide at N.Y. and 16.95 feet below a Bench Mark on Buffalo Light House, South Pier, Buffalo N.Y. Zero of staff gauges denotes same level.

WATER LEVEL OF LAKE ERIE AT BUFFALO N.Y. and ERIE PA.

CHART VI

WEEK ENDING DEC 10, 1910



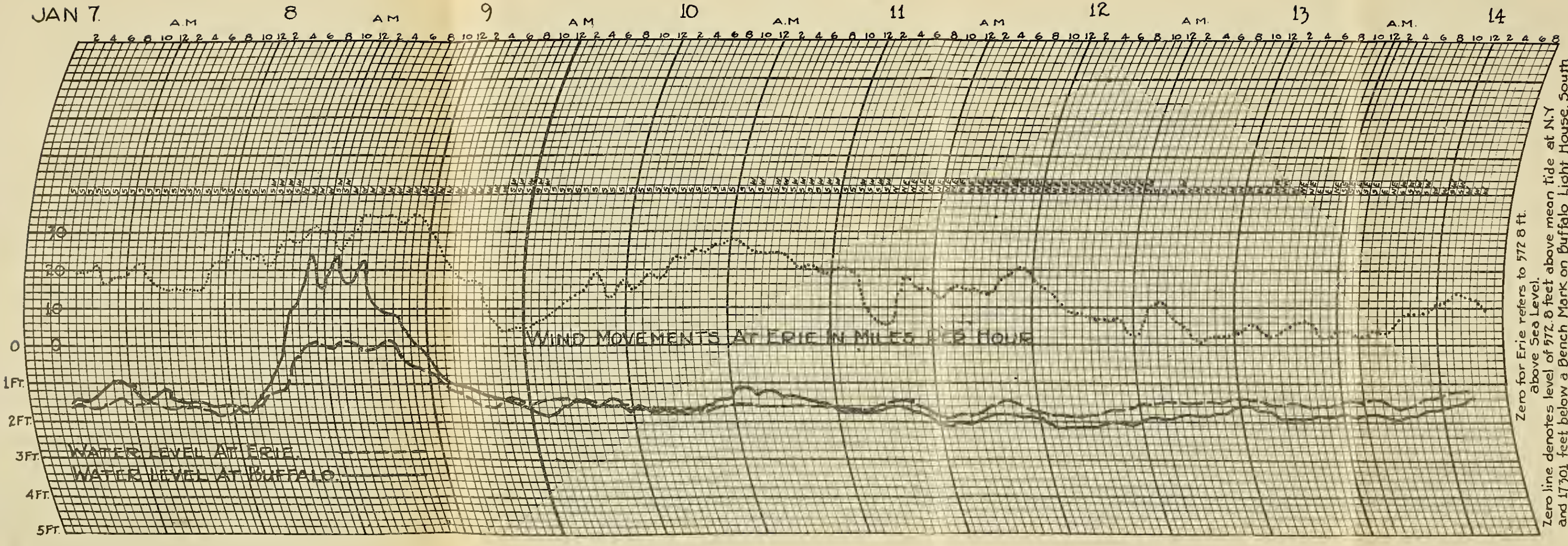
Zero For Erie Refers To 572.8 feet above sea level

Zero line denotes level of 573.15 feet above mean tide at N.Y. and 1695 feet below a Bench Mark on Buffalo Light House, South Pier, Buffalo, New York. Zero of staff gauges denotes same level.

WATER LEVEL OF LAKE ERIE AT BUFFALO N.Y. AND ERIE PA.

CHART VII.

Week Ending Jan. 14. 1911

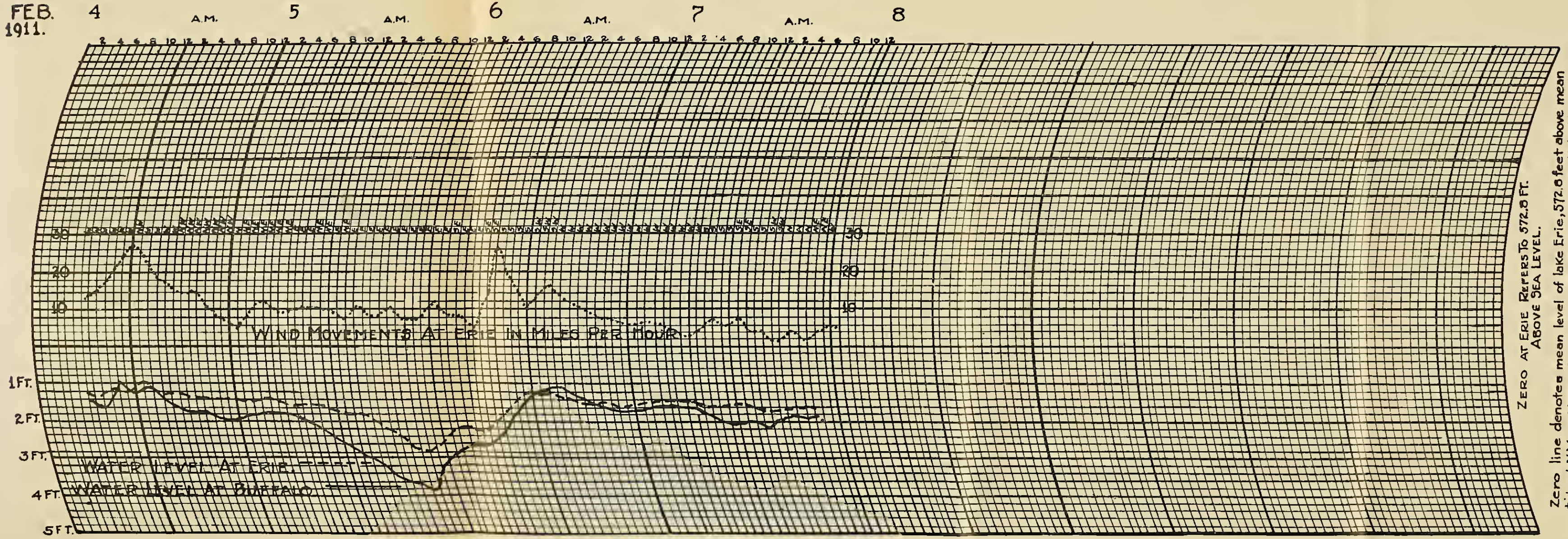


Zero for Erie refers to 572 8 ft. above Sea Level.

Zero line denotes level of 572.8 feet above mean tide at N.Y and 17301 feet below a Bench Mark on Buffalo Light House, South Pier, Buffalo N.Y. Zero of Staff gauges denotes same level.

WATER LEVEL OF LAKE ERIE, AT BUFFALO, N.Y. AND ERIE, PA.

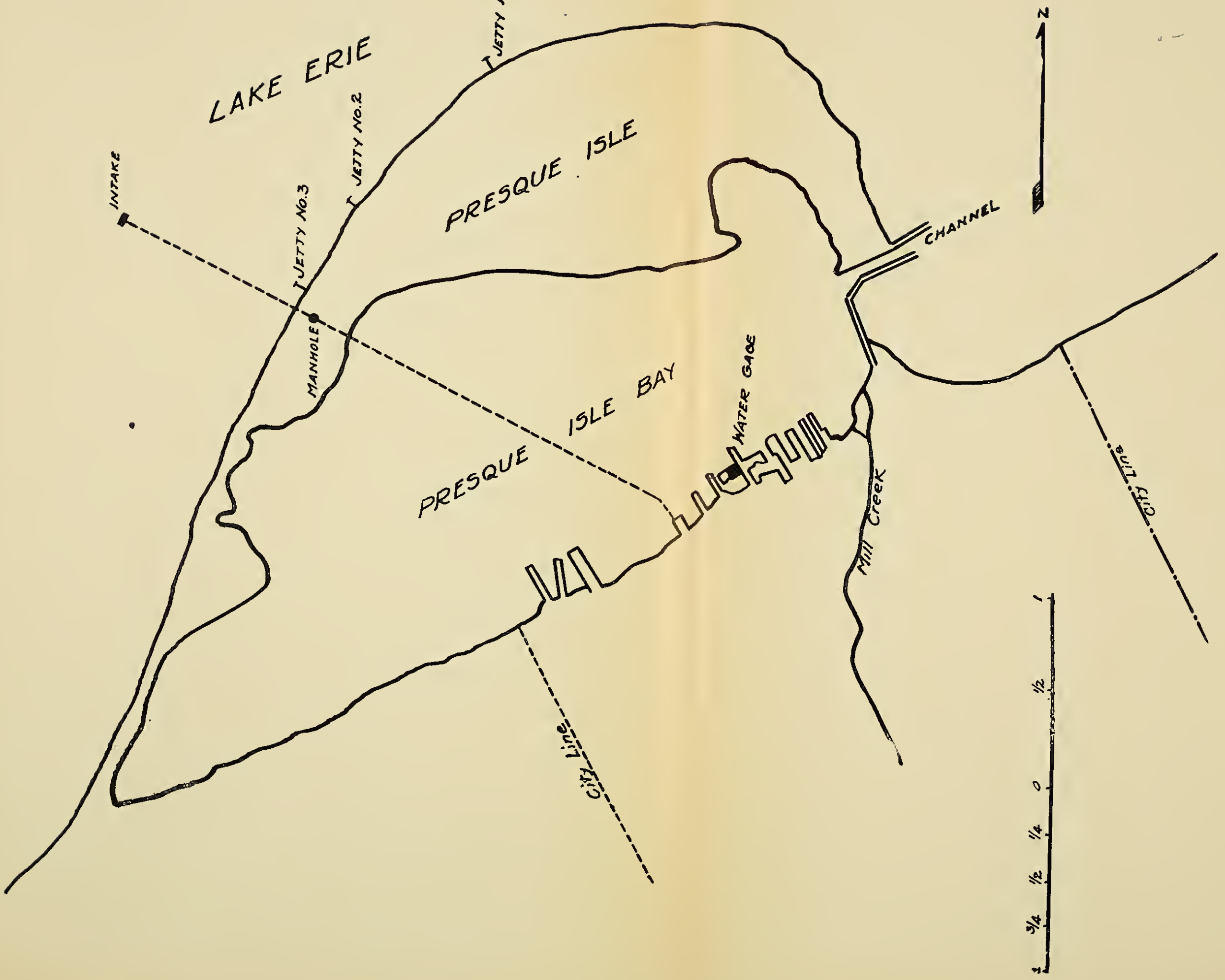
CHART VIII



ZERO AT ERIE REFERS TO 572.8 FT. ABOVE SEA LEVEL.

Zero line denotes mean level of lake Erie, 572.8 feet above mean tide at N.Y. and 17.301 feet below a Bench Mark on Buffalo Light House South Pier, Buffalo N.Y. Zero of staff gauges denotes same level.

CHART IX.


LAKE ERIE
INTAKE
JETTY No.3
JETTY No.2
JETTY No.1
PRESQUE ISLE
MANHOLE
PRESQUE ISLE BAY
WATER GAGE
CHANNEL
Mill Creek
City Line
City Line
N
1
½
0
¼
½
¾
1

also show the constriction in the lake in width and depth near Erie, which, together with the considerable deeper channel along our shore, are coincidences that have an important bearing on the problem in hand.

At Detroit 69 per cent. of the winds are from the west, at Cleveland, 43 per cent., at Erie, 50 per cent., and at Buffalo, 61 per cent. of the winds are westerly. They vary considerably for the several months of the year. Westerly winds predominate largely. At Erie the prevailing direction is west from January to July, in August it becomes south and continues there during September and October, and in November and December it becomes southwest. Easterly winds are least frequent in November; they increase slowly during the winter and spring months till May, when they are most frequent, they then decrease slowly during the summer months until November.

The average percentage of time in which the wind at Erie was from the several directions during seven years is indicated in the following table:

Direction.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
North, ...	8	9	8	9	6	9	11	12	10	12	7	6
Northeast, ...	6	9	15	11	16	13	12	13	8	7	6	5
East, ...	6	7	6	7	9	9	5	9	7	7	5	8
Southeast, ...	6	4	3	3	6	6	4	6	9	8	5	5
South, ...	18	16	18	15	17	17	19	20	26	20	20	13
Southwest, ..	22	17	12	14	15	15	16	14	16	18	23	26
West, ...	24	28	25	27	22	22	23	17	15	13	18	24
Northwest, ..	11	11	12	14	8	9	11	10	10	14	15	12

The average current of the Lake at Erie due to the discharge of Niagara River (which is 210,000 cubic feet a second at mean lake level) is about three-eighths of a mile a day. This movement is so slight as to be practically negligible in considering the movements of the lake's water. Other currents are due to a small extent to differences in temperature. The shallow, main portion of the lake is warmed quite rapidly in the Spring, but, owing to the much greater depth of the eastern portion of the lake, and since prevailing westerly winds have crowded the Winter's ice into this portion in April and May, the temperature continues low here long after the main portion of the lake has been warmed Temperatures taken by the Bureau of Fisheries off Long Point in July ranged as low as 42 degrees. It is probable that in the deepest portion of the lake the temperature never rises much above 40 degrees throughout the year. The winds must really be considered the main cause of the very complex system of currents in the lake. They reach a magnitude due to this cause far beyond what would ordinarily be expected. Fishermen, whose nets are set along the lake's bottom for miles, like extended tennis nets, frequently have them moved by the force of the water in some instances for miles, and occasionally they are never found at all.

The friction between the winds and the surface of the water is a matter of common knowledge. The trade winds of the tropics induce the well defined equatorial currents in the oceans, and even the more fitful westerly winds of the higher latitudes cause a system of currents in the North Atlantic and Pacific Oceans that move to the eastward. When these currents encounter land they are deflected to the north and southward. The winds on landlocked bodies of water cause similar currents of less magnitude. There is this important difference however—when the current reaches the end of the lake, there is no escape for its waters as there is for those of the ocean, and, in consequence the water accumulates on the lee side of the lake and is lowered on the weather side. This phenomenon was probably first noticed on Lake Geneva in Switzerland where it received the name "Seiche," a term that is now almost universally used. The Germans who observed this same effect on the Baltic Sea, called it, "The Seebar." This word has sometimes been improperly Englished into Seabear. Differences in atmospheric pressure on opposite ends of a lake disturb the level of the water, but even in extreme cases the effect is comparatively small.

The cyclonic and anticyclonis disturbances that are ever moving across the United States in a general eastward direction, and cause all the winds of importance, are of such large diameter that on Lake Erie winds of considerable velocity have a common direction from end to end of the lake. Thus a wind blowing along the major axis of the lake will induce a current practically simultaneously over the entire length and to the full width of the lake. This extensive surface current crowds the water into the lee end of the lake and, since there is no escape for the water laterally it accumulates there, whereupon the surface of the lake becomes an inclined plane as is shown by the dotted red line on Chart II. Under currents though they undoubtedly form even in the earlier stages of the seiche are much impeded by friction with the surface current and by the inertia of the water. The forward movement of practically the entire lake's surface waters in the initial stage of the seiche gives rise to great momentum. It follows that when these waters encounter the shore at the end of the lake much higher stages are produced than are due to the wind alone. When the force due to the inertia of the water is expended the entire surface of the lake becomes unstable, and gravity, in restoring the equilibrium, will cause the water to swing back even in the face of the wind and set in motion a series of oscillations from end to end of the lake, with a nodal line near its centre, that decrease in magnitude until the water comes to rest, or is disturbed anew. The period of these oscillations on Lake Erie is about sixteen hours for the larger seiches, and from 14 to 15 hours for those of smaller magnitude. At Buffalo, where the instrumental exposure is especially favorable for obtaining wind values, velocities of from 60 to 75 miles an hour for westerly winds, and from 30 to 45 miles for easterly winds are not a rare occurrence. They produce changes in the lake level there of from 4 to 6 feet. The absolute range between the high water caused by westerly gales and the low stages due to easterly storms is about 12 feet.

Chart III is a record of the water level at Buffalo and at Amherstburg, and the wind velocity and direction at Buffalo November 16th to 30th, 1900. It illustrates seiches due to both easterly and westerly storms. It will be noted that the lake is never at rest. Attention is called to the rythmic swing of the water; the coincidence of the high water at either end of the lake with the low stage at the other, with corresponding complementary stages, to the direct effect of the force of the wind on the amplitude of the oscillations; and to the difference in effect between westerly and easterly winds. It may be suggested in passing that this was a rather stormy period; the gale on the 21st was the severest of the year, with an extreme wind velocity of 80 miles at Buffalo and 49 miles at Erie.

The general lake level varies considerably during the year, and to a smaller extent from year to year. The curves on Chart III refer to a level 570 feet above the sea.

If Lake Erie were of uniform depth it is probable that the seiche would not produce pronounced currents in any section, for the water would then move east and westward with the seiche in oscillations of comparatively small amplitude. Reference to the contour chart and to the sectional areas at various points discloses the reduced sectional area near Erie, causing the seiche current to double, approximately, in velocity and to increase the distance covered in like proportion in this part of the lake. By examining the curves of water level at Buffalo and Erie, shown by Charts IV to VIII it is unexpectedly found that, though the rise and fall of the water at Erie is not as great as at Buffalo, there is a remarkably coincidence in the time of the oscillations, an effect probably due to the hydrostatic unity of this deep portion of the lake. It follows that a rise of the eastern portion of the lake, as shown by the gauges at Erie and Buffalo, can only occur by water flowing eastward through the narrows in sufficient quantity to effect the change in level, and vice versa. The area of the lake east of the narrows is to the area of the cross section at Erie approximately as 4,000 to 1. Assuming that the lake east of the narrows changes level in all sections at the same time and in equal proportion and that the resulting current through the narrows is uniform throughout, the movement of water there would be 4,000 feet for each foot in the change of level east of the narrows. The greatest rise at Erie in recent years was 3.2 feet, due to a severe westerly gale. The greatest fall was 2.4 feet caused by high easterly winds. At Buffalo these values are 6.4 and 5.3 feet respectively. Using the means of the extreme changes of Erie and Buffalo for tentative values of the fluctuations of the lake level east of the narrows (they probably are considerably too high) we get an east and west amplitude of the current at Erie, due to the seiche alone, of nearly 4 miles in the highest westerly gales and something over 3 miles in the maximum easterly storms.

The occasions when winds coincide with the major axis of the lake for considerable periods are exceptional, and, therefore, it is rare that currents occur that are of uniform velocity for the entire width of the lake. In most cases the wind is at an angle to the shore, and this gives rise to an important modification of the movement of the water, and also of the nature of the seiche. A current meeting the shore at an acute angle is deflected, and moving along its new course, parallel with the shore, is crowded by the onsetting current it is constantly meeting into a smaller sectional area and, in consequence, its velocity increases. The water level along a lee shore is also raised, a tendency that increases as the angle of the wind with the shore approaches a right angle, when true seiche effects occur. Currents deflected by the shore from a few degrees to about 45 degrees have noticeably increased velocities, as has been shown. Indeed, the returning swing of the water of the seiche often only modifies their forward movement. As a result of this excessive current on one side of the lake, return currents, mostly as under currents, are generated toward the opposite side. These return, or counter currents, are frequently found by fishermen. The comparatively straight, regular south shore of the lake is the more favorable to the deflected currents, and, with a width extending far into the lake, they attain such force in west to northwest gales that nets set along the bottom of the lake toward the south shore are sometimes carried miles eastward. They are, on rarer occasions, carried westward in northeast storms, though not nearly so far, owing to the fact that easterly winds never attain the force of those from the west. Since currents from the east, be they deflected or not, are of such vital importance to this inquiry, all confirmatory evidence available is of value. It is to be regretted that there are no data at hand regarding currents in the lake about Erie made with deep water floats under all conditions. It has been a generally accepted theory that the preponderence of westerly winds, together with the general eastward flow of the water (a value usually greatly exaggerated) would prevent the formation of easterly currents of any importance, and, it is confessed that, without investigating, the writer had a similar belief until recently.

It has been shown that the water moved westward not to exceed four miles in the severest westerly gales when the seiche swung back from Buffalo. This movement of the water, being in the face of the wind, is largely an under current If the westerly gale that has piled up the water in the east should diminish at a time when the water is highest, the water will rush back with considerable force, and being a deep current, it will meet the upward sloping bottom opposite Erie, and produce much turbidity in the lake water there. Indeed, so much light refuse and matter of all kinds is raised from the bottom of the lake at these times as to clog fish nets, which, with this added resistance to the current, are often carried westward, twisted and torn. Though this "backwash," as it is termed by fishermen, is intense at times, its amplitude is so limited that it does not seem probable that it can carry sewage from the mouth of Erie Harbor for more than 5 miles westward against a surface current to the mouth of the intake pipe. In addition, for reasons that will be discussed later, the water discharged from Erie Harbor at such times is not polluted to a large extent.

It is thought that it may be safely assumed that no wind from the westerly quadrant will, at any time, cause currents that will pollute the water supply of Erie with its own sewage. Winds from the south and southeast cause noticeable currents across the lake, and carry the large amount of sewage that empties from the harbor into the lake at such times north and northwestward into the lake, passing 2 to 6 miles east of the mouth of the intake. These winds are almost invariably followed by southwest and west winds, usually of considerable velocity, which carry the sewage eastward and the general drift in that direction afterward makes it highly improbable that any contamination of the city water can occur at such times.

There remains to be considered the effect on lake currents of winds from the northeast quadrant. Of these, winds about northeast are most important. They induce currents that meet the southern shore of the lake at an angle, are deflected in the manner previously shown, and flow westward along this shore for many miles during extended periods of northeast winds. These winds are usually of moderate velocity but are the steadiest of all winds. They are influenced only slightly by diurnal variations, which have so marked an effect here on westerly and southerly winds. In addition, though extended periods of northeast winds are infrequent, when they do occur they ofttimes continue for from 36 to 72 hours. All these are conditions favorable to the formation of easterly currents along the south shore of the lake. There is direct evidence that such currents form, and it will be considered here.

By referring to Chart IX it will be observed that three jetties extend into the lake from the outside shore of the Peninsula inclosing Erie Harbor. These jetties were built by the United States Government to prevent the washing away of the shore, which is a fine sand. The sand. carried by currents from the west, always accumulates on the western sides of the jetties. Eddies forming on the eastern sides will gradually remove the sand there. As a rule, the western sides of these jetties have large banks of sand almost to their outer ends, and there is deep water on the east sides, showing the effect of the large preponderance of westerly currents. It is found, however, that during periods of northeast winds sand collects on the east sides of these jetties and large quantities of that banked on the western sides are carried away. The process sets in shortly after the springing up of northeast winds and continues as long as they blow from that quarter. It is evident that the current from the east has sufficient movement to form eddies strong enough to excavate large quantities of this sand. The peninsula, extending into the lake almost three miles tends to accelerate the movement of this current along its outside shore.

The difference in temperature of the water of various portions of the lake has been touched upon. In the Spring the prevailing westerly winds crowd the ice from the main portion of the lake into the eastern end and the water of the main, shallow portion, is warmed rapidly as summer approaches, enabling fishermen to begin operations in the west in April. They agree that by the end of June it is most improbable that the water in any portion of the lake west of the narrows is colder than 65 degrees. In the eastern portion, where there is ice for a month or more after it has disappeared in the west, the water is colder, and, on account of its depth, remains colder than that west of the narrows throughout the year. The temperature readings taken in the deep portion of the lake by the Bureau of Fisheries confirm the belief that the water at the lowest levels is practically uniform throughout the year at about the temperature of water at its greatest density. The wide difference in temperature between waters east of Erie and those to the west should, in itself, disclose the source of lake currents, whether they flow from the uniformly warm, shallow main body or come from the colder, eastern portion where the temperature decreases steadily as the depth increases. The approximate strength of an easterly current would be indicated by its temperature, for only strong currents, generated on the surface, could disturb the deeper water.

During 1910 the Water Commissioners courteously made daily readings of water temperature in the lake off jetty No. 3, and at the intake crib in the lake (taken through a manhole in the intake pipe where it reaches the shore) using a standard Weather Bureau water thermometer. An examination of these readings shows very little fluctuation in temperature during the highest westerly winds. An especially favorable period of westerly winds began August 4th, and continued for 72 hours. During this time the winds were mostly west-northwest of from 10 to 20 miles an hour, a condition most favorable to the formation of currents from the west along the south shore. Chart IV A showing the temperature curves and the hourly force and direction of the wind during this period shows a fall of only three degrees, and this was probably due to the cooler weather that prevailed at this time. An examination of the record for the entire season shows very similar results and confirms the opinion that the temperature of the lake west of the narrows for the end of July and during the first week in August varied very little from 70 degrees.

The following are the results of northeast winds on water temperature: On June 24th and 25th, the wind movement averaged 12 miles an hour from the northeast for 44 hours. The temperature of the water at jetty No. 3 fell from 70 degrees to 64 degrees in 24 hours and then rose slowly to 71 degrees under the influence of moderate southwest to west winds by the 3rd of July. On the 4th of July the wind again became northeast and varied little from that direction for 40 hours, with an average force of 13 miles an hour. The water temperature fell from 71 degrees on the morning of the 4th to 60 degrees on the morning of the 5th. Under the influence of southerly to westerly winds, varying from 6 to 15 miles an hour, it rose to 73 degrees on the 10th. A period of northeast winds that began July 16th will be used as the subject of Chart IV, to which attention is called. The wind shifted to northeast shortly after 3 p. m. July 16th, and soon became brisk. By 8 a. m. of the 17th the water at jetty No. 3 had fallen to 59 degrees and at the intake to 56 degrees. The wind continued brisk northeast until 8 a. m. of the 18th (excepting a period of east winds early on the 18th) when the temperature at both intake and the jetty had fallen to 54 degrees. By the evening of the 18th, the wind had become light but it continued in a generally northeasterly direction of small movement until midnight of the 19th. After this time the wind was southerly to westerly for days. The temperature of the water at the intake did not return to normal until the 23rd. The conclusion seems inevitable that the cold water about jetty No. 3 and the intake in the lake, occurring only during east, and especially northeast winds, is carried from the only place in the lake where such low temperatures are found in mid-summer, viz., the deep eastern portion. It follows also that the current moving westward on this occasion was of sufficient volume and velocity to bring up water that was 18 degrees colder than that at the surface. It appears that this cold water was carried far to the westward, for, in spite of the heating of this water in a July sun in relatively moderate depths surrounded by warmer water, the temperature at the intake did not return to normal until the 23rd, after a total wind movement of almost 1,000 miles from the south and southwest had driven the cold water back eastward of the intake, (or was it warmed and remained for even a longer period about the intake?) In this case the intake was evidently surrounded for more than six days by water brought along the shore from the lake east of Erie. The westward flow of these currents is undoubtedly promoted by the deep channel found in the lake west of Erie.

Currents in the lake are not confined to periods of storm, however. Fishermen experience a great variety of movements in the lake water even in the lightest winds. Bodies of men from wrecked boats just barely come to the surface after a time and are carried by surface lake currents for weeks and months. Bodies from wrecks about the Pelee passage are most frequently found along the shore east of Cleveland. Bodies have been known to cross the lake from Long Point and be washed ashore near Erie, and on a few occasions men lost along the south shore of the lake were, after weeks, found miles to the westward. The general direction from the wrecks to the points where the bodies have been picked up is the resultant of a varied series of movements of the lake currents, probably quite circuitous. Winds of insufficient force to cause an effective seiche, if blowing steadily from any direction for many hours will cause such persistent stress on the water surface as to set in motion currents of varying depths over large areas, and it seems probable, as a consequence, that, on the rare occasions when there are extended periods of east wind, easterly currents of considerable magnitude are induced.

During 1910 winds of considerable force from the northeast, or near northeast, that continued for more than 24 hours occurred as follows:

1. January 12, 13, 14, 15—76 hours from E-NE; average force, 10 miles per hour.
2. February 16, 17—34 hours from NE-N; average force, 18 miles per hour.
3. February 27, 28, March 1—35 hours from NE; average force, 8 miles per hour.
4. April 11, 12—30 hours from NE average force, 12 miles per hour.
5. June 9, 10, 11—50 hours from NE; average force, 9 miles per hour.
6. June 24, 25—44 hours NE-E; average force, 12 miles per hour.
7. July 4, 5—40 hours from NE; average force, 13 miles per hour.
8. July 16, 17, 18—60 hours from NE; average force, 11 miles per hour.
9. August 28, 29, 30—40 hours from NE; average force. 14 miles per hour
10. August 31, Sept. 1—52 hours from NE-E; average force, 9 miles per hour.
11. Sept. 13, 14—45 hours from NE; average force, 8 miles per hour.
12. Sept. 18, 19, 20—35 hours from NE-E; average force, 7 miles per hour.

13. Nov. 27, 28—30 hours mostly E; average force, 9 miles per hour.

14. Dec. 4, 5, 6—58 hours NE-E; average force, 14 miles per hour.

It is thought reasonable to assume that on each of these 14 occasions during 1910 currents of sufficient magnitude were formed and carried any contamination that may have been discharged into them from Erie Harbor for many miles to the westward along the shore. Cases Nos. 2, 3, 8, 9, 10, 11 and 13 appear to have been especially dangerous, because the subsequent wind movements were such as to extend the possible period of contamination of the city's water supply by permitting the water brought west by the current to remain in the region of the intake, or by returning it over that region.

If, under the conditions discussed, extensive currents move westward along the lake shore past Erie, it is pertinent to inquire whether sewage discharged into Erie Harbor could find its way into this current and be carried westward around the Pensinsula, to and beyond the region of the intake.

Erie Harbor is about 5 miles long and averages one and one half miles wide. It has an area of nearly 160,000,000 square feet. The channel at the east end of the Harbor is its only connection with the lake. Fluctuations in the level of the Harbor can occur only by supplying or discharging the requisite amount of water through the channel. The automatic gauge maintained by the U. S. Engineers in the canal basin in the Harbor (see Chart IX) records these fluctuations.

All but a small portion of the city's sewage is discharged into the lower portion of the Harbor. Half of it is carried by Mill Creek alone. In quiet weather the sewage accumulating in the lower Harbor makes it decidely offensive during the summer months. When easterly winds lower the water of the eastern end of the lake this sewage pours through the channel into the lake at the rate of 16,000,000 cubic feet per each tenth of a foot of fall in the water level. The 14 periods of east and northeast winds during 1910, mentioned above, were attended by an average fall in the lake level of one foot at Erie, which is equivalent to the discharge of 160,000,000 cubic feet of polluted water into the lake each time and, by dangerous coincidence, *at the only time when currents of considerable magnitude moving westward could exist.* Currents from the east are deflected by the peninsula and increased in velocity along its shore. The concrete piers that mark the entrances to the harbor, built to preserve the channel, project out into the lake and serve to send outpouring harbor water, that, at times, has a velocity of from 4 to 7 miles an hour, well out into the current moving westward around the Peninsula at such times.

Westerly winds first raise the water at Erie, and, by pouring large quantities of lake water into the Harbor, the sewage is crowded back. When the subsequent fall comes, this water, with some sewage, is emptied back into the lake, only slightly polluted as compared with that which is poured out during easterly winds.

The writer concludes that there is sufficient evidence at hand to warrant the assumption that it is possible for sewage to be carried from Erie Harbor out into the Lake and westward around the Peninsula to and beyond where the city water supply is taken from the lake: that such pollution of the water supply may occur during any month of the year, (excepting that it is modified during the winter months by lake ice which prevents the action of the wind over the area so covered) and that contamination may continue in the region of the intake for several days after the primary cause has ceased.

Since it is desired that the occasions be discussed when the water supply of the city possibly could have become contaminated during November and December, 1910 and January 1911, Charts V, VI, VII, and VIII have been prepared to illustrate several dangerous periods during these months.

On Chart V it will be noted that the wind shifted from N to NE at 10 p. m. November 26th. It became east at midnight and continued east, and sometimes northeast, until 3 a. m. of the 28th with a steady movement averaging not quite 10 miles an hour. The temperature evidence illustrated by Chart IV indicated that water from the deeper portion of the lake may be carried westward to the intake pipe in less than 20 hours of NE-E winds. It is thought likely that the 30 hours of steady east winds in the case under consideration would, at least, create a marked surface current around the peninsula. The water in the Harbor fell one foot in 24 hours on this occasion, so that 160,000,000 cubic feet of polluted water was emptied into the lake as a consequence, and, possibly was carried thence westward around the Peninsula. Several days of strong west winds followed and, no doubt, soon drove any pollution far to the eastward.

Chart VI shows that at 4 p. m. December 4th the wind became northesat and that it continued E-NE until 3 a. m. of the 7th a total of 58 hours. The wind movement during this period was 743 miles an average of 13 miles an hour. The water in the harbor fell nine-tenths of a foot during the first 30 hours of this period, equivalent to a discharge of 144,000,000 cubic feet of harbor water. An examination of the conditions makes it plausible that sewage was carried westward beyond the Peninsula on this occasion and that there may have been sewage in the region of the intake for at least 3 days.

Following this pronounced December period of dangerous conditions there were no easterly winds of importance until 7 p. m. of January 11th when the wind suddenly veered to northeast and continued steadily in that direction for 30 hours, with an average movement of 13 miles an hour. The water in the Harbor fell half a foot during this period, which caused a discharge of 80,000,000 cubic feet of harbor water into the lake. The energy of the wind in the earlier stages of this period, reaching at times an hourly movement of 21 miles, and its steady northeast direction make it probable that there was considerable current westward around the Peninsula on this occasion. There followed 30 hours of little wind of any kind and then moderate west to northwest movements on the 14th, 15th and 16th. It is possible that there was sewage in the region of the intake from the 12th to the 16th of the month.

The next period of easterly winds began at 1 p. m., February 5th, when the wind shifted to NE-E and continued for 24 hours. The water fell two feet during this time which would cause an enormous discharge of harbor water. The wind velocity averaged less than 10 miles an hour. If any harbor water reached the intake on this occasion, which is possible, it was soon driven out into the lake by the high southwest winds that followed.

2.—The Watson Paper Mills Investigation.

a.—Water Works System Upper Plant.

The upper paper mill of the H. F. Watson Co., is located on the north side of 16th Street between French and Holland. There are also a few buildings belonging to this company on the east side of Holland Street opposite the main works.

The water works of this plant might be divided into three parts. First water for drinking purposes and occasional use in the boilers. Second, water for manufacturing purposes and third, water for fire protection.

First, water for drinking purposes is obtained from the city mains only. It is secured from three connections, all of which are metered. There are no connections between this pipe system and that of the fire or industrial pipe systems. From this metered water supply water is used for a three thousand HP boiler except when the water pumped from the bay for industrial purposes is in suitable condition for boiler purposes at which time the city water is shut off from the boiler and the bay water used instead. The following is a statement obtained from the Commissioners of Water Works regarding the readings taken from the meters belonging to the H. F. Watson Co., which are located as follows:

1st.—On the east side of French Street between the railroad and 16th Street:

Date	Reading Cubic Feet	Consumed Cubic Feet
8-30-10,	327,737	......
9-20-10,	332,700	5,034
10-22-10,	343,900	11,209
11-26-10,	351,500	7,541
12-19-10,	357,771	6,194
1-27-11,	364,500	6,851
2-25-11,	370,331	5,785

2nd.—On Holland Street between the railroad and 16th Street:

Date	Reading Cubic Feet	Consumed Cubic Feet
8-30-10,	9,878,180	......
9-20-10,	9,982,216	104,036
10-21-10,	10,182,600	200,384
11-26-10,	10,389,756	207,156
12-20-10,	10,490,795	100,969
1-27-11,	10,661,246	170,521
2-25-11,	10,796,189	134,943

3rd.—On 16th Street between French and Holland Streets:

Date	Reading Cubic Feet	Consumed Cubic Feet
8-30-10,	1,612,134	......
9-20-10,	1,680,836	68,702
10-21-10,	1,818,774	137,938
11-26-10,	1,931,355	112,581
12-20-10,	2,008,410	77,055
1-26-11,	2,109,846	101,436
2-25-11,	2,176,554	66,708

Second, water for manufacturing purposes, about 2,000,000 gallons daily, is obtained from the bay. It is pumped to the plant through a 12 inch main which empties into a wooden tank placed above a building in the central part of the square occupied by the plant. This tank is 15 feet in diameter and 20 feet high with one inlet and several outlets. The water in the 12 inch line on the way from the bay to the tank passes through a Wheeler condenser that condenses the steam from the 900 H. P. engine. This is a surface condenser. The water in passing through the condenser becomes luke-warm. From the condenser it continues on through the 12 inch main into the tank. The 12 inch main empties into the tank over the upper edge. There is no check valve or float and any surplus goes to the storm sewer by the way of an overflow. Into the open end of the 12 inch pipe is inserted a 6 inch pipe leading to a gasometer used as a storage tank. The water is admitted into the gasometer over the upper edge of the tank through a 4 inch line as the 6 inch line from the elevated tank reduces to four inches shortly before reaching the gasometer. The height of water in the gasometer is regulated by a float. There is no overflow pipe for the gasometer, the excess water going over the edge of the tank into an open trench about the bottom and thence to an open sewer. The tank has but one opening, that being at the bottom, this is a 12 inch main leading to the fire pump. All water for manufacturing purposes is obtained from the high wooden tank except a small amount used in the asbestos room. The water leaves this elevated tank through one 6 inch and several 4 inch lines and goes to the various parts of the mill.

Third, water for the fire pump is obtained only from the gasometer. The gasometer is 21 feet high and about 57 feet in diameter, holding approximately 400,000 gallons. Water leaves only through a 12 inch main near the bottom, the centre of main being about 18 inches above the bottom of the tank. This main goes direct to the fire pump. On its way one 6 inch line leaves this 12 inch main and goes to the asbestos room. From this 6 inch line two 1.5 inch lines go to sprinklers at the felt machine. The two 1.5 inch lines and the 6 inch use together about 50 or 60 thousand gallons daily. It is estimated that of the 60 thousand gallons, the two lines feeding the sprinklers on the felt machines use 48,000 gallons. The fire pump is a Worthington high pressure pump, size 18x10x12. This pump is usually run at 70 strokes a minute and at that speed delivers approximately 1000 gallons a minute. The suction is 12 inches and the discharge 8 inches. On the 8 inch discharge a gate valve is located immediately outside the pump. A pressure gauge is located between the pump and the gate valve. This gate valve is said to be opened only when a fire occurs and when an inspection of the water system is made together with a hose test. When an inspection is made the water inspector is present. It was stated that the last fire occurred during the summer of 1910. The last hose test was said to have been in August 1910. According to the Commissioner of Water Works the fire tests on the fire service system of the H. F. Watson Co. at both the upper and lower plants were made on the following days:

List of Fire Tests on the Fire Service System of the H. F. Watson Company.

Seal Broken	Resealed.
1 September 9, 1903,	September 9, 1903.
2 February 3, 1904,	February 3, 1904.
3 October 1, 1904,	October 1st, 1904.
4 May 31, 1905,	May 31st, 1905.
5 May 6th, 1906,	May 6, 1906.
6 February 7, 1907,	February 16, 1907.
7 August 13, 1907,	August 13, 1907.
8 May 28, 1908,	May 28, 1908.
9 May 28th, 1909,	May 28, 1909.
10 July 18, 1909,	July 18, 1909.
11 October 16, 1909,	October 16, 1909.
12 August 29, 1910,	August 30, 1910.

The fire pump is kept under steam pressure all the time and once daily is tested to see that the steam connection is properly made. This test consists of opening the steam valve until the pump makes a stroke and then the steam shuts off. Once or twice each week steam is turned on and the pump operated until the water on the gage reaches 110 to 125 pounds. During such tests the gate valve on the discharge line remains closed.

The fire pump system is connected with the automatic sprinkling system which is under pressure from the city mains by way of the gate valve on the discharge line a short distance from the fire pump. When a fire occurs bay water may be pumped into the sprinkling system and to fire plugs about the plant. At other times the bay water supplying the pump and the city water supplying the sprinklers are separated by the gate valve just referred to. Also a check valve is located a short distance from the fire pump on the discharge line from the fire pump to prevent city water from reaching the fire pump and a check valve is located in the city mains before they connect with the fire lines operating the sprinklers in order to prevent the bay water from entering the city mains.

The fire pump operator in demonstrating how the daily and weekly test was made started the pump and with a few strokes the water gage read 110 pounds steam it was then shut off and the pressure allowed to fall back to zero. During this test the gate valve on the discharge line was closed and it was affirmed that this gate valve was always closed during such tests. To demonstrate whether or not the check valve on the fire pump discharge line was operating properly or not, the valve on he pump suction line was closed and the gate valve on the discharge line opened and the valve chambers on the pump drained. No water appeared in the valve chambers as would be expected if the check valve under 42 pounds pressure from the city was leaking.

The fire system was installed in 1902 and 1903, and appeared to be in good condition when inspected by the Department in 1911. Six samples of harbor water used for industrial and fire purposes at the upper mill were collected, and all but one showed the presence of sewage organisms. Twenty-nine samples of city water were collected at the mills of the upper plant and all showed the absence of sewage organisms. The city water collections were divided 10 from hydrants not connected to the mills fire service pipe lines, and 19 connected to said fire lines. Between 350 and 375 men and women are usually employed at this upper mill. Many of these are foreigners. The names of the employees were carefully gone over and compared with the names of those in the city having typhoid fever. On the day of the Department's inspection no employes were absent on account of sickness. There were however, during the epidemic six victims who worked at this upper plant of the Watson Company. The dates of the onset of these six cases ranged from January 12, to February 15th.

It would hardly be possible, in view of all of these circumstances, for polluted harbor water to have been passed through the fire lines of the Watson Mills and have been forced into the public water pipes of the town and from thence up into the high service district and have caused the general outbreak both in the high and low service district all over the city, such as is recorded in the Erie epidemic. Furthermore, if the water in the city mains near the Watson Mills were polluted, it would be manifest in the number of cases of sickness among the employees who drank the water in the mills and also among the citizens of the neighborhood.

b.—Water Works System Lower Plant.

Bordering the bay to the west of Sassafras Street is located the lower plant of the H. F. Watson Co., which is called the saturating plant. It is under the same management as the upper plant. There is also installed a fire and industrial system using bay water, a fire sprinkling system and domestic service using city water. As in the upper plant the fire sprinkling system and the fire pump system are connected at one point, as will be described in detail. The following is a statement obtained from the Commissioners of Water Works regarding the readings taken from the meter at this plant for boiler and domestic uses gallons:

	Meter Reading. Gallons.	Consumed Gallons.
Aug. 19, 1910,	10,805,630	......
Sept. 14, 1910,	10,903,460	97,830
Oct. 12, 1910,	11,043,445	139,985
Nov. 16, 1910,	11,255,996	212,551
Dec. 12, 1910,	11,397,438	141,442
Jan. 18, 1911,	11,601,200	203,762
Feb. 15, 1911,	11,756,700	155,500

Water for drinking purposes is obtained from the 6 inch main on Sassafras Street, at a point about 600 feet from the bay. This service is metered. A 2.5 inch main goes direct to two 600 HP boilers where the city water is used for boiler purposes and a tap for drinking purposes. A 1.5 inch branch from this 2.5 inch main goes to the office where it is used for drinking purposes in the office and for drinking purposes from a cooler located just outside the office at a more convenient point for the workmen.

From the city on Sassafras Street about 400 feet south of the point where the connection is made for boiler and office purposes, a six inch connection is made to the fire sprinkling system. This 6 inch connection is equipped with a gate valve and also a check valve. The gate valve remains opened under ordinary circumstances. The water pressure at this point is given by the water commission as being 180 pounds. The sprinkling system extends to the principal buildings in this part of the plant.

The industrial and fire pump system obtains water from the bay. This system was installed at the time of building the plant in 1903, and consisted of a crib and intake well and suction lines to each of two pumps. The intake well is located about 30 feet from the water's edge during ordinary weather conditions. The intake well is connected by way of a 24 inch wooden water main to the intake crib about 75 or 100 feet distant. In 1910 the intake from the bay was extended 163 feet. From the intake well a 6 inch main extends to the pump room in the machine shop. The water from this pump is used for cooling purposes in all parts of the plant. A 10 inch main extends from the intake well to the fire pump. The fire pump is a Knowles-Underwriter pump, size 16x9x12. This pump is always under steam pressure and is tested daily and weekly as is done in the upper plant. Also inspections are made at this plant whenever any inspections are made at the upper plant, and the records of the Commissioners of Water Works show that fire tests on the fire system of this plant were made at the same time or directly following the tests made at the upper plant. The fire pump has a capacity of 750 gallons a minute when operating at a speed of 70 revolutions a minute. The discharge line, which is 8 inches in diameter, has a gate valve located a short distance from the pump. This gate valve it is said is opened only when an inspection is made by the fire inspector or in case of fire The fire pump discharges directly into the sprinkling system and also to fire hydrants located at different parts of the plant. As in the upper plant the sprinkling system which receives city water is separated from the bay water by the valve located on the discharge line to the fire pump. According to the superintendent no fires occurred in this plant for over two years from date of inspection.

Usually about 90 men are employed at this works and at the time of inspection there were no employees absent on account of typhoid fever, and at no time during the epidemic was there typhoid fever among any of the employees at this lower plant.

Five samples of water in the city mains outside of the lower plant property were collected and analyzed by the Department and found to be free from contamination. Seven samples of city water in the pipe lines of the Company were collected and analyzed by the Department and found to be free from contamination. Investigations were conducted in March at both the upper and lower plants when there was no doubt whatsoever about the purity of the general public supply, so that if any contaminated water were found in the city mains it could have readily been charged up against the harbor water leakage under higher pressure from the industrial pipe lines to the city pipe lines.

It was concluded that the use of harbor water at these paper mills had nothing whatever to do with the Erie epidemic.

3. Conclusions.

a. Elimination of every medium but water.

Flies were not a factor in the causation of the outbreak.

Ice is precluded as a contributory factor for the various reasons hereinbefore given; also vegetables, fruit and shell fish.

The significance of the dysentery outbreaks in the early parts of December and January must not be overlooked. These two separate outbreaks followed a period of turbid water about which the consumers complained. Hardly a family in the city but had one or more cases of dysentery. No other possible medium of transmission of this infection than water is conceivable.

The season did not favor personal contact infection. In fact there were 37 secondary cases only up to February 1st and 81 up to February 20th. The typhoid was explosive in character. By reference to the chart it appears that the last sixth of December and the first sixth of January cover the period of the peak of the first typhoid outbreak; and the last sixth of January and the first sixth of February cover the peak of the second typhoid outbreak which was by all odds the larger.

With the physical conditions obtaining with respect to the Erie water works from 15 to 20 days would be the optimum period for typhoid onsets to manifest themselves among the water consumers after any unusual disturbances in Erie harbor producing a belching forth of enormous quantities of grossly polluted sewage water into the lake. By reference to Mr. Oberholzer's report it appears that there were such disturbances and phenomena in the early part of December and of January.

Milk cannot be charged with the responsbiility of producing either the dysentery outbreaks or the typhoid outbreaks, as hereinbefore fully set forth in the discussion of Erie's milk supply. So there remains but one other medium, and that is the public water as a primary cause.

b. Discussion of Lake Water Pollution.

Because the bacterial analyses of the lake water from February 1st, on failed to show marked sewage pollution, this cannot be accepted as proof of anything but the quality of the water in the sample collected. The quantity of water collected in one sample was one seven hundred millionth part of the total amount of water being drawn each day from Lake Erie and furnished to the people of the city. This very insignificant quantity of sample water, it must be borne in mind, was collected once out of each 24 hours at the lake intake. A series of samples collected every few minutes throughout the 24 hours would have undoubtedly shown very different results than those heretofore given in this report of the quality of Lake Erie water from February first, on during 1911.

During November, 1910, the U. S. Government was engaged in dredging about 90,000 cubic yards of sewage mud and other sediment deposited in he channel of Erie harbor near the mouth of Mill Creek. This filth was dumped a few miles east of Erie in the lake near the mouth of Four Mile Creek. It was the accumulation of many years and must have been, like similar deposits of organic matter, in a septic state of putrefaction. Undoubtedly if it had been deposited near the lake intake, the material would have contaminated the Erie city water supply and been capable of producing the intestinal disorder which prevailed during December and January, the same as ordinary sewage will do when free from pathogenic organisms. Even though the material were dumped at a considerable distance from the water works intake, it is possible that some of it was carried by lake currents westward over the intake. But the danger from this source is not considered nearly so iminent as that of Erie city sewage discharged daily into the harbor and which constantly menaces the purity of the city's water supply.

As Mr. Oberholzer has shown, in the early part of December, 144,000,000 cubic feet of grossly polluted water was poured through a 300 foot channel out into Lake Erie from the harbor in a space of 30 hours and this sewage field lay off in the region of the intake possibly for three days. Again on January 11, 80,000,000 cubic feet of harbor water was forced out into the lake in 30 hours, when there was a very considerable current westward around the peninsula, followed by a period of 30 hours of little wind movement so that the sewage held may have remained in the region of the intake from the 12th to the 16th of January.

The whole question of lake currents about Erie city requires much careful study and experimental work in connection with the disposal of the city's sewage and the protection of the purity of the city water supply; but we are in possession of enough data to conclude safely that the currents can come from any direction and it is dangerous to place dependence on them for the protection of the water supply. Erie's intake is subject at times to sewage pollution and hence the improvement of the manner in which the city's sewage is disposed of is demanded and the treatment of the water supplied to the city by filtration is a necessity. The treatment of the water with a germicide answers as the best temporary safeguard; but it is not absolute. The interests of the city of Erie demand the best water supply. Nothing short of a modern filtration plant can meet the need. The sedimentation basin on Presque Isle has failed during the year to relieve the water at times from turbidity and at such times the people were again aroused to the peril of insanitary conditions as taught by the lesson of the epidemic which under more fortunate circumstances escaped recognition. The past admonitions of the city and the State Health authorities have thus come to be accepted and before the conclusion of the year the water commissioners had had preliminary plans of a filtration plant placed before them for consideration. It is expected that early in the year 1912, the final plans and specifications will be submitted to the Commissioner of Health for approval.

Dr. Allen J. McLaughlin, of the Hygienic Laboratory of the Public Health and Marine Hospital Service of the United States, concluded his studies and report for the Federal Government on the sewage pollution of the Pennsylvania shore of Lake Erie, with special reference to the spread of typhoid fever at Erie, as follows:

"1. An excessive typhoid fever rate has prevailed in Erie for many years. In 10 out of the past 11 years this excess has been due to unusually high rates in winter and spring.

"2. The entire sewage of Erie goes into Erie Harbor and Lake Erie.

"3. Up to 1908, the public water supply was taken from the grossly polluted Erie Harbor direct and delivered untreated and unfiltered to the consumers. Since September, 1908, the water supply has been drawn from Lake Erie 5,000 feet north of Presque Isle. This intake was subject to occasional pollution, depending upon certain combinations of weather conditions.

"4. The pollution of Lake Erie by sewage outside of the city of Erie on the Pennsylvania shore of the lake is at present a negligible quantity.

"5. The permit to discharge sewage granted by the State Commissioner of Health to the Erie Improvement Co., has several important provisions. These indicate that the State intends to exercise its supervisory power over the proposed new city, insuring that raw sewage will be discharged into Lake Erie from this source only temporarily, and that adequate sewage treatment will be demanded when the city actually comes into existence.

"6. Conditions necessary to produce sewage pollution of the Erie intake are a lake current from east to west around Presque Isle and a rapid lowering of level in Erie Harbor, producing rapid discharge of a large quantity of sewage polluted water from the harbor into the lake current.

"These conditions are produced by winds from various directions but the most dangerous degree by continued winds from the southwest quadrant.

"From a careful study of data giving stage of water, direction of wind, and velocity of wind hourly for each day during December, 1910, and January, 1911, it is evident that the most favorable conditions for pollution of the Erie water works intake existed on December 9, 1910, and on January 9, 1911.

"Corroborative evidence that such pollution of the water supply through the lake intake actually took place is furnished by the explosive outbreak that occurred, in each instance about 21 days after the beginning of the period of probable pollution.

"7. Pollution of Erie Harbor and other portions of Erie's water front by the sewage of the city of Erie, coupled with failure to filter or treat the public water supply, have been responsible for outbreaks of typhoid fever in the winter and spring months in Erie, including the epidemic of January and February, 1911.

"Dependence upon Lake Erie currents to carry sewage-polluted water away from the water works intake at Erie gave a sense of false security which made possible the disaster of January and February, 1911. The placing of an intake in Lake Erie as great a distance as 5 miles from the nearest source of pollution, and to the westward thereof, only affords protection to the intake part of the time. In other words, such an intake is exposed to occasional pollution of a serious character.

"9. Lake Erie currents are very unstable and irregular and no dependence can be placed upon them for protection of an intake from sewage polluted water.

"10. During the period from January 1, 1900, to February 28, 1911, there were over 3,200 cases of typhoid fever in Erie and 320 deaths. Allowing an average typhoid death rate of 20 per 100,000 population, Erie should not have had more than 150 deaths and 1,500 cases, so that at a conservative estimate there were at least 170 deaths and 1,700 cases of typhoid fever which were preventable, should never have occurred, and which were in all probability due to polluted water.

"11. An outbreak of an acute diarrheal disease locally called winter cholera occurred about December 10, 1910. It was very widespread, attacking thousands, although, as a rule, not fatal in result. A similar disease has occurred before, and it seems to precede by two or three weeks severe typhoid outbreaks, and is generally supposed to be due to sewage pollution of the public water supply.

"12. Deaths from diarrhea and enteritis in Erie are not in excess, and child mortality is but slightly higher in Erie than the average for Pennsylvania. Upon investigation this was found to be due in 1909, to an excess of deaths from measles and whooping cough and was unconnected with the character of the water supply.

"13. If the proposed plan for treating the sewage of Erie as outlined above is carried into successful operation there will be a vast improvement over existing conditions and the menace from Erie's sewage will be greatly reduced.

"14. The installation of a hypochlorite plant in Erie this year is a valuable temporary protection against typhoid but a more permanent system of filtration will be exacted in the near future, rapid sand filtration with a coagulant probably being used which will add to the advantage of a safe water, the quality being clear every day in the year.

"The Commissioner of Health will require also that the filtration be effected on the mainland near the present pumping station. This is necessary to guard against possible leakage either now present or in the future, due to imperfections or injury of the steel pipe submerged below the sewage polluted waters of the harbor.

"15. In view of the commercial and industrial importance of Erie and because of the enormous traffics carried on in the harbor excessive prevalence of typhoid fever and a contaminated water supply constitute a serious menace to the public health. Not only are employees engaged in interstate traffic exposed to this menace, but persons from other states traveling to or through Erie are similarly exposed. Any of these persons becoming infected in Erie may travel to their homes during the incubation period or to lake ports in other states and there fall ill and be responsible for secondary cases."

25. TYPHOID FEVER AT MARIANNA.

On May 27th, 1911, the Marianna Water Company of Marianna Borough, Washington County, Pennsylvania, submitted for the approval of the Commissioner of Health general plans for a water filtration plant. These plans were the outcome of an order from the Commissioner of Health, following an outbreak of typhoid fever in the borough during the winter of 1910-1911. The circumstances connected with this outbreak, with a description of the water works and of the proposed improvements, are given in the following report.

General Conditions.

On March 16, 1911, on instructions from the Commissioner of Health, that the Chief Engineer should send to Marianna in company with the Associate Chief Medical Inspector Dr. C. J. Hunt, such assistants from the Engineering Division as might be necessary in running down the origin of the typhoid fever outbreak in said borough and in taking measures to stop the spread of the disease. He assigned Assistant Engineer R. E. Irwin to that part of the field work relating to the treatment of the water supply, if this should be required, and Assistant Engineer W. H. Ennis to an investigation of the water works system and sewerage system of the borough. Mr. R. B. Styer went as an assistant from the office and Inspectors Souder and Imler were ordered from Washington, Pa., to Marianna to assist in the investigation. In a general way these men were under the direction of Dr. Hunt; they had also received written instructions. It was anticipated that the outbreak would be of a water-borne character because of the nature of the public water supply.

On August 28th, 1909, the Commissioner of Health issued a decree to the Marianna Water Company under the following conditions and stipulations:

"FIRST: That on or before six weeks from the date of this permit the water company shall prepare plans for a water purification plant for the treatment and purification of the water supplied by it to its consumers and submit said plans to the Commissioner of Health for approval.

"SECOND: That when said plans shall have been modified amended or approved, that the water company shall proceed forthwith to build and operate the purification plant.

"THIRD: Detail plans of the dam, intake well, pumping station, force main, tanks and reservoirs and the plan of the watershed shall be prepared by the water company and filed in the office of the State Department of Health on or before January first, nineteen hundred and ten.

FOURTH: The water pipes may be extended in the streets of the town and at the close of each season's work plans of such pipe extensions shall be prepared and filed in the office of the State Department of Health, together with any other information in connection with the State that may be required to the end that the State Department of Health, together with any other information in connection with the State that may be required to the end that the State Department of Health may be always informed of the extent of the water works and the public use thereof.

"FIFTH: If at any time in the opinion of the State Department of Health, the water works system or water supplied thereby or any part thereof has become prejudicial to the public health, then such remedial measures shall be adopted as the Commissioner of Health may advise or approve."

None of the conditions were fulfilled but the company proceeded to complete the water works system and extended the distributing pipes from year to year and built a new reservoir and served the public with unpurified creek water, regardless of the terms of the decree.

In the report accompanying the decree the water company's attention was called to several matters, as follows:

"In view of the extended watershed and its population, the North Fork of the Ten Mile Creek is a dangerous source of water supply of domestic purposes. Temporary laborers' camps are set up on the watershed. Any such occupation of the watershed may become the focus of infection of the creek water resulting in a widespread epidemic in Marianna. Furthermore, coal mining operations on the watershed will increase the menaces to the purity of the proposed supply so that future conditions are bound to be even more dangerous than at the present time. The water should be purified by filtration.

"The water company should provide for the purification of all water supplied by it in the village, at the coke ovens and mines and other works.

"It has been observed by the State Department of Health that if unfiltered and sewage-laden water be supplied throughout industrial works where the employees can get to the water, that they will drink it carelessly in spite of admonitions to the contrary, in preference to going to some point further removed to procure water that is filtered and perhaps cooled with ice. As a health protective measure, therefore, the filtering of all water delivered into pipes from which any water may be drawn for drinking purposes is demanded. The cost of filtration works is not prohibitive. It is a good business proposition for a private corporation to supply pure and wholesome water.

"Detail plans for a water purification system should be submitted to the Commissioner of Health and be approved before the plant is constructed. Furthermore, detail plans of the pipe lines, reservoirs and tanks and pumping station, intake well and dam and of the watershed should be prepared and filed by the Water Company in the office of the State Department of Health.

"The said Department will have a sanitary survey made of the North Fork of Ten Mile Creek and remove therefrom all menaces to the purity of the waters of said creek. The water company should exercise a lively interest in maintaining the natural purity of these waters and should maintain a sanitary patrol for this purpose and acquaint the State Department of Health of the location of any temporary or permanent source of stream pollution on the watershed."

The water company did, on November 19th, 1909, address the following communication to the Commissioner of Health:

"Dear Sir:—In compliance with the conditions under which the charter for the Marianna Water Company was granted, I herewith attach a plan for proposed water purification and filter plant for your approval.

"Yours very truly,

"A. C. BEESON,
"Chief Engineer."

The plan submitted was a small sketch without details and was not considered a bona fide attempt to submit plans for the installation of a water purification plant for Marianna borough.

In the following pages, that part of the report dealing with the water works system and the distribution of typhoid fever cases was largely written by Mr. Ennis. That part of the report relating to the treatment of the public water was prepared by Mr. Irwin.

Water Works System.

The water works of the town are owned and operated by the Marianna Water Company, chartered December 21st, 1908, for the purpose of supplying water to the public in West Bethlehem Township, Washington County. The charter provides that the source of supply shall be the North Fork of the Ten Mile Creek and Little Mills Run, 1½ miles from its mouth, all in West Bethlehem Township. Before describing in detail the system it may be well to have a concise idea of the character and size of the borough. When the water company was chartered Marianna was a village. It was incorporated into a borough in March, 1910. The town is a coal mining community of about 2,000 population, located at the terminus of the Ellsworth Branch of the Pennsylvania Railroad and on the North Fork of Ten Mile Creek about nine miles from its mouth. After making an 180 degree bend by a sharp curve in the middle of the town, which forms a sort of peninsula on which the principal part of the village is located, the creek flows in a general easterly direction for about nine miles through West Bethlehem Township to the Monongahela River at Millsboro.

The principal part of Marianna lies north of the creek. The town was built by the Pittsburgh-Buffalo Company, a large coal mining and coke manufacturing corporation, for its employees in the mines and at the coke ovens in the vicinity. Most of the houses are of brick construction and all of the dwellings are provided with baths and other modern conveniences. Many sidewalks have been laid, roads have been constructed, shade trees planted and altogether the borough presents a far more attractive appearance than the average mining settlement. The company now operates two shafts and 160 coke ovens and gives employment to between 800 and 1,000 hands. It is anticipated that the number of employees will be doubled in the immediate future.

Along the creek banks there is some flat land for a short distance, back from which the surface rises rapidly, reaching an elevation in the northern part of the town of nearly 300 feet above the stream. The town should be classed as hilly. Surface drainage is excellent and all into the creek, mostly at points above the dam built across the stream about two-thirds of the way down-stream from the borough. This dam is a concrete structure about 8 feet high and ponds the water up in the creek back for a half mile or more.

Sewerage and drainage facilities have been provided for all the buildings in the town and they were constructed by the Pittsburgh-Buffalo Company and are maintained by said company. These sewers receive both sewage and storm water. There are 63 privy vaults in use. Besides the public water supply, there are three individual springs and 25 drilled wells scattered about the town. The wells are 5½ inches in diameter and range in depth from 30 to 90 feet, all cased to rock. The sewerage system has two outlets both into the creek below the dam.

The water works system consists of a dam, intake well, pumping station, force main and distributing system. The source is Ten Mile Creek at the dam hereinbefore mentioned. This dam is a concrete structure about 8 feet high and 100 feet long. The intake well is located partly in the creek and partly in the bank on the Marianna side of the creek and immediately above the dam. The well rests on the creek bottom and is 23 feet high and 16 feet in diameter. It is built of brick and the lower courses are laid with openings between the bricks. Outside of the well the openings were covered with layers of broken stone, gravel and sand banked up against the wall to a thickness of 5 feet. A large portion of this material has been displaced by the flow of the stream. The creek water must pass through this strainer to the well.

The pump house of brick construction is located 250 feet north of the creek bank. The boiler house is up on the hillside 350 feet distant from the pump house. There are two Jeanesville horizontal compound duplex pumping engines installed in the pump house each having a rated capacity of 500 gallons a minute under a 500 foot head. There is a 10-inch diameter suction main extending from each pump to the well on the creek bank. The pumps discharge into an 8-inch force main.

The force main leads northerly a distance of about 3,000 feet terminating in a large reservoir located on the hill summit in the borough. Along the line of the force main connections are made to four wooden tanks and from it the distributing pipes also extend. The tanks have a capacity of 70,000 gallons each. Three of them are located on the slope below the houses in the borough and furnish water for boiler purposes at the power house and for quenching the coke oven fires. The fourth tank is located on a knoll above the greater portion of the town and until the completion of the storage reservoir held the surplus water from the distributing system. At present this tank is shut off.

The storage reservoir was completed in December, 1910. It is of concrete construction, circular in shape, 230 feet in diameter, has a depth of 15 feet at the flow line and a storage capacity of two million gallons. The elevation of the reservoir is about 550 feet above the pumping station. The basin is not enclosed by a fence. The common force and gravity main terminates in a brick chamber located in the centre of the basin. The valve chamber is located on the main just outside of the reservoir. There is a 10 inch blow-off provided with connections to the sewerage system.

The distributing system comprises about 18,000 feet of 4-inch and 6-inch diameter cast-iron pipe. There are 12 dead ends in the piping system, at 5 of which there are fire hydrants. At 7 of the ends there are valved blow-offs. Fire hydrants are also placed at important street corners. There are 427 houses connected to the piping system.

The daily consumption is reported to range from 250,000 gallons to 410,000 gallons. The industrial consumption is thought to range from 170,000 to 200,000 gallons in 24 hours. The domestic consumption at times may not exceed 80,000 gallons daily. The north fork of the Ten Mile Creek has its source in Morris Township about 14 miles northeast of Marianna. It follows a general easterly course to Marianna and at the water works intake drains an area of 100 square miles of farming country, of rolling topography, well watered and fertile. It is thought that less than 15 per cent. of this area is wooded. On the watershed there are a number of villages and a total of 964 properties and a resident population, including a portion of Marianna, of 3,314 persons. During the summer of 1910 the State Department of Health conducted a sanitary survey of the entire watershed above Marianna and found thereon 259 properties that were in an unsatisfactory condition, causing 458 stream pollutions. Notices of abatement were served and up to February, 1911, all but 92 of these properties had been put in a satisfactory condition.

About a mile west of Marianna is the tributary from the north, called Little Ten Mile Creek; about 8 miles west the main tributary from the north, named Bane Creek. The line of the Waynesboro and Washington Railroad crosses the watershed from north to south, paralleling Bane Creek, and it is one other possible source of stream pollution. A very small amount of mine drainage from the workings of the Pittsburgh-Buffalo Company is discharged into the creek above the water works intake.

The North Fork is subject to sudden changes in height and is invariably turbid in the extreme during and after rainfalls. The flow of the creek is not reported but it is known to be seriously affected by continued droughts. The storage above the dam is not sufficient to provide sedimentation of any great amount.

Typhoid Fever Outbreak.

Marianna has, so it is reported by the local authorities, seldom been entirely free from typhoid fever, since one or more cases occur every few months. However, the State records show differently. Three cases only were reported between the first of the year 1908 and March 1st, 1911. Between February 9th and April 16th inclusive of 1911, there were 63 cases of typhoid fever.

The Department's representative arrived in Marianna at noon on March 17th. Dr. Hunt personally visited all of the cases and diagnosed them as typhoid fever. The dates of onset of the disease, or the dates when the patients first felt ill are given in the following table:

1911.	Cases.
February 9,	1
February 11,	1
February 20,	4
February 21,	2
February 24,	1
February 25,	3
February 27,	3
March 1,	8
March 2,	2
March 4,	1
March 6,	3
March 7,	3
March 8,	1
March 10,	3
March 11,	2
March 12,	4
March 14,	1
March 15,	1
March 19,	1
March 25,	1
March 27,	1
March 30,	2
April 2,	2
April 5,	1
April 6,	2
April 10,	3
April 14,	1
April 15,	1
April 16,	3
April 19,	1
	63

Dr. Hunt determined that the disease was of water-borne origin and remedial measures were taken accordingly. Twenty-four of the patients were supplied with Campbell milk, 13 with Shape milk, 16 with Horn milk and 10 patients had milk from miscellaneous sources and three used no milk whatever. The principal dairy farms were visited by the inspectors and nothing suspicious was found in connection with the milk supply.

Before the Department's representative arrived in Marianna, the water company had collected samples from springs and pumps and spigots in the town and sent them to Pittsburgh for examination. The results were received on the evening of March 17th, and they showed two private springs to have been polluted with sewage and that the public supply was also polluted. One of the three springs in the town is located on the hill above house No. 912 and is known as the hill side spring. This was found polluted and on advice of the Department was closed on March 18th, so also was the Miller spring at house No. 124. The spring at house No. 1000 had not been tested at that time, but it was thought advisable to put it out of commission and hence it was boarded up and warning signs posted here and at the Miller spring against the use of water for drinking purposes. Hillside spring was walled up and the flow turned into the sewer.

The Department took samples of water from each of the 25 drilled wells about town and the results were all negative. The general sanitary condition throughout the town were excellent. The settlement being new, there was no rubbish, garbage or filth accumulated at any place. The houses are all numbered regardless of the location on the street. The Department's officers visited every house and building and found 63 outside privies in commission. They are about 6 feet deep and in good sanitary condition. There are 24 one-room shanties in the town; 6 of which only were occupied at the time. All of the buildings in the town have inside sink connections with the sewer except houses 5 to 17 inclusive. In these cases the sinks are on the outside of the houses.

Taking all of the circumstances into account it was determined that the typhoid fever outbreak was due to water transmission and that the infection came through the medium of the public water supply. Quite a large number of the victims of the disease used driven well water for drinking purposes and it was thought that possibly this might be the source but the conclusions were to the contrary. Forty-six of the 63 patients were 25 years of age or under and 33 of the 63 were 15 years of age or under. Furthermore, 43 of the patients lived at home and had no employment In looking for the original source of infection on the watershed, it was found that typhoid fever had been prevalent on the watershed above the Marianna intake. The dates of the cases were substantially as follows:

Typhoid Fever on the Watershed.

1910	
August 1,	Jesse Moore.
September 15,	Gray.
September 27,	McClain.
October 1,	Mrs. J. Moore.
October 8,	Walker.
October 21,	Reese.
November 6,	Stanley Moore.
November 7,	Jonty Moore.
November 9,	Grooves.
November 9,	Lucy.
December 1,	Cecelia Moore.
December 23,	Grooves.
1911.	
February 1,	Grimes.

The disposal of the sewage at the home of Grimes, Grooves, Lucy and Gray was satisfactory. Before the doctor's visit at the home of Walker and Reese, the dejecta were thrown undisinfected into an open privy on the bank of the creek.

Before McClain was sent to the hospital at Washington, the dejecta were thrown into the privy or creek as the case might be.

The family of Jesse Moore living at Lone Pine, Amwell Township, Washington, County, consists of six persons, of whom five had typhoid fever. The dejecta were thrown untreated on to the surface of the ground along the bank of the creek. The privy vault was full and overflowing and its location is subject to inundation when the creek rises.

The first part of February there was a flood stage in the creek and the waters wash the ground on which the dejecta had been thrown. Dr. Hunt saw the evidence of this on the day of his inspection. The Moore property is situated about 7 miles distant above the water works intake. At the time of the freshet the new distributing reservoir was not in commission, but the upper wooden tank was in use. Between the 20th and 27th of February, 13 cases of typhoid fever had appeared in the town and in two weeks' time from the appearance of the outbreak, 40 victims were reported.

The water company had drained the water works system of pipes and reservoirs and tanks before the Department's representatives appeared in Marianna. All of the public water consumers had been notified by the water company on the 15th of March, the day on which the system was drained, not to use the water for domestic purposes. The Assistant Engineers at once proceeded to install a chlorinated lime treatment plant for the temporary disinfection of the water being supplied to the borough. This plant was put in operation at four o'clock in the morning of March 18th and has since been continued in use. All the fire hydrants and dead ends in the water pipe system were opened on March 18th and the system was thoroughly drained and flushed with treated water. All household taps were also opened and the storage tank on the hill drained, as well as the distributing reservoir. The sterilizing plant was set up on the bank of the creek near the pump well and the chemicals introduced into the suction main.

Two dosing apparatus were set up for feeding the chlorinated lime. Each consisted of a mixing barrel with a discharge about 8 inches from the bottom. This barrel discharged into either of two feed barrels so that one feed barrel could be filled while the other was in operation. One pound of lime was added to 30 inches of water and after mixing this solution was run into the feeding barrel and then fed into the suction main. Thus a solution of a known strength was fed into the suction mains delivering a known amount of water to the consumers. A dosing apparatus was attached to each main so that both suction mains could be dosed if at any time both were in operation. This temporary plant was completed for operation at 4 A. M., March 18th. From this time until noon on March 18th, 0.3 of a grain of chlorinated lime to the gallon was used. Treated water was pumped through the system, the surplus passing to the reservoir. During this time but one pump was in operation and was running at full capacity. Thus during the eight hours about 34,000 gallons of water was treated with 0.3 of a grain of chlorinated lime to the gallon. The greater part of this water went to the reservoir as the domestic consumption was small. About 10 A. M. several men were sent out to open the blow-offs, fire hydrants and house taps. Also a 12-inch drain pipe at the reservoir was opened about 11 o'clock. By 2.30 P. M. the reservoir had been drained, as well as the house taps where the houses were occupied, and a part of those unoccupied where the water was turned on at the street main. After noon the chlorinated lime dose was reduced to 0.15 and this amount has since been used constantly. Directions were given to the superintendent to use 0.15 grains of this stronger lime to the gallon when the water was clear and to increase the dose as the turbidity increased, also the superintendent was instructed to have an accurate and detailed record kept of the operation of the lime process, this record to show the amount of lime added in the mixing barrel and the time when the lime was added and when this solution was fed into the feeding barrels also to indicate the rate at which the solution was fed into the suction main and the rate the pumps were running at that time.

These reports have been submitted and filed in the office and the Department has made frequent analyses of the raw and treated water. It has thus been demonstrated that after rains and the sudden rising of the stage of the creek, sewage pollution is evident in the water. On April 5th and 6th was the first high stage immediately following scouring rainfalls. The raw water on these days contained form 8 to 50 B. Coli per c. c., but no B. Coli were found in the treated water.

Proposed Improvements.

In the application of May 27th, 1911, for approval of plans for a water filtration plant, the water company makes the following representation:

"That the Marianna Water Company, as required by the Commissioner of Health of the Commonwealth of Pennsylvania, has prepared the attached plans covering the filtration system to be applied to the existing lines of the company."

The plans submitted are general only and in this connection the company states in a letter as follows:

> "If our general plans are satisfactory to you and meet all your requirements we will have one of the companies from which we have received bids make up their detail plans and the same will be furnished you at once, together with the specifications and efficiency guarantee, these to be subject to your further approval."

It is proposed to filter all the water to be used for domestic purposes and to pump it through a new force main into the distributing reservoir on the hill, from whence it will flow by gravity into the town distributing pipe system. It is also proposed to deliver raw water unfiltered to the coke ovens, to the boiler plants and for industrial purposes. As hereinbefore stated, there are now two pumps installed at the pump house each of 750,000 gallons in 24 hours. One of these pumps is to be used only for pumping raw water from the intake well to the filter plant. It will also pump raw water to the washery, to Tanks Nos. 1, 2, and 3, for industrial purposes and to the boiler house and coke ovens. The other pump is to have its suction in the filtered water well and is to be used only to raise the filtered water through a new 8 inch cast iron force main to the distributing reservoir near at hand.

The normal capacity of the filtration plant is to be 500,000 gallons per 24 hours. The raw water is to be delivered into a sedimentation tank which will be a circular wooden structure holding about 90,000 gallons. From this tank the water will flow by gravity to the adjoining filter house in which two units are to be built, each 11 feet in diameter, having an effective filtering area of 190 square feet. Sulphate of alumina is to be used as a coagulant and introduced into the 10 inch raw water suction pipe before the water enters the pump. The normal capacity of the plant will afford approximately four hours' subsidence. From the filters the water will flow to a concrete clear well of 12,000 gallons capacity, located under the sedimentation tank. This clear well will be in fact a pump well for the suction of the second pump. If these general plans are approved by the Commissioner of Health, the company will then buy the filters and equipment and enter into a contract for the construction, subject to the approval of the details by the State Department of Health.

With the large storage of filtered water on the hill it will not be necessary for the company to operate the water filters continuously, but the pump supplying the industrial water will be operated continuously.

Discussion.

The Marianna mines have been described in current engineering literature as the most modern coal operation in America. With the exception of several mines along the Monongahela River, Marianna is at present the only opening in the great continuous coal field of about 800 square miles, which extends from the national road on the north to the Fairmont outcrop on the south and from the Monongahela River to the Wabash Railroad on the west. This vast area is entirely underlaid with the celebrated Pittsburgh seam coal from which the Great Pittsburgh industrial district must draw its fuel supply in the immediate future. The mines at Marianna are designed for a very large output daily and no effort nor expense has been spared to make the working safe. The town has been laid out and more dwellings have been erected than are now occupied. All of this has been accomplished in anticipation of an assured future growth. In looking out for the convenience of its employees and for their health, the Pittsburgh-Buffalo Company has erected and maintained a large bath house with all modern facilities where the miners in coming from the work may wash themselves. It would not seem that a company operating under such a broad liberal policy would intentionally lay aside the advise and admonition of the Commissioner of Health of the Commonwealth relative to such an important matter as the purity of the public water supply. Whatever the contributory cause to the delay in building a modern filtration plant may have been, the company now stands ready to proceed forthwith to install the improvement. The plans proposed for a general layout are satisfactory and no delay should ensue in contracting for the equipment and installation of a complete filter plant.

Decree of the Commissioner of Health.

In view of all the circumstances, the Commissioner of Health on June 30, 1911, approved the general layout for a filter plant subject to the following conditions and stipulations:

"FIRST: That the detail plans for the filter plant shall be submitted to the Commissioner of Health for approval on or before the first day of August, 1911, and that the company shall erect and put into commission the filter plant as approved, modified or amended by the State Department of Health before the close of the current season.

"SECOND: The water company should continue the use of the chlorinated lime treatment of the water supplied by it to the public until the filter plant has been built and put in commission.

"THIRD: The detailed plans to be worked out and submitted to the Commissioner of Health for approval shall be so arranged as to make impossible the supplying of raw creek water to the water consumers, excepting, of course, such water as is furnished in raw water pipes for industrial purposes.

"FOURTH: The company shall plan to build a protecting fence about the reservoir on the hill."

26. TYPHOID FEVER AT MARYSVILLE.

On October 23rd, 1911, the local Board of Health of Marysvlile, Perry County, Pa., requested the Commissioner of Health to examine the water being supplied by the Marysville Water Company to the town. The following day five samples of water were collected and analyzed with negative results. Typhoid fever above the normal was then existing in Marysville. On November 4th, Assistant Engineer W. H. Ennis, accompanied by Inspector Zeigler, made a thorough investigation of the water works and the conditions relative to typhoid fever in the borough. Mr. Ennis wrote a report from which the following report was largely copied:

General Conditions.

Marysville Borough, having a population in 1910 of 1,693 inhabitants, is a substantial, residential and railroad community, located in the extreme southeastern part of Perry County on the west bank of the Susquehanna River. In 1900 the population was 1,463.

The town is on the Middle Division of the Pennsylvania Railroad, extending from Harrisburg to Pittsburgh. The Valley Traction Company operates a trolley line in the borough affording additional communication with the city of Harrisburg, located 6 miles southward.

The borough abuts the river for a distance of over 2 miles and extends back therefrom for about one mile. The township of Rye forms the northern and western boundary and the Cumberland County line forms the southern boundary. Along the river bank the ground surface is quite level, elevated about 15 feet above normal water stages, while back therefrom the ground surface is rolling. The natural drainage is into the river and Fishing Creek, a stream of considerable size which flows easterly through the south central part of the borough to its junction with the river.

The principal part of the borough lies north of Fishing Creek. The principal business street of the town is Main Street, which parallels the river. The tracks and yards of the Pennsylvania Railroad are parallel to Main Street and separate this thoroughfare from the residential part of the town.

The inhabitants of the borough are largely employed by the Pennsylvania Railroad in the freight yards, although the Central Zinc Company and the Seidel Brothers Forge Works afford employment to a considerable number.

Sewerage.

The borough has a combined system of sewers built in 1901 covering fairly completely the built-up portion of the town but only about 100 dwellings are connected thereto. The predominating method of sewage disposal is into dug privy vaults which are scattered about the town. Kitchen wastes and wash water in many instances, are discharged to the ground surface and into street gutters.

The public sewers discharge domestic sewage and storm water by way of three outlets into the Susquehanna River within the borough limits, one at Walnut street, one at Front street and one at Third street. All of the sewer outlets are elevated considerably above low water stages of the river. The Walnut street outlet is about 700 feet and the Front street outlet not over 300 feet above the water works intake from which river water is drawn for industrial purposes and is available for emergencies for domestic use. The Walnut street sewer outlet is 4 feet wide and 18 inches high and the Front street outlet 6 feet wide and 4 feet high.

Existing Water Works.

The public generally is supplied with water by the Marysville Water Company. Aside from this supply water is obtained from 25 dug wells located on individual estates.

The Marysville Water Company was chartered April 3rd, 1895, for the purpose of supplying water to the public in the borough of Marysville and to those persons residing adjacent thereto, as may desire the same. The water works system was built the same year and comprises intake dams, gravity supply mains, an equalizing reservoir and distributing system, and an auxiliary pumping staton. The normal domestic supply is obtained from two mountain streams known as Trout Run and Sitterley Farm Run and the auxiliary industrial and emergency supply from the Susquehanna River.

Trout Run has its source in Rye Township about 2½ miles southwest of the borough and flows in a general easterly and northerly course joining Fishing Creek at a point nearly one mile west of Marysville borough. The stream drains mountainous land heavily wooded with second growth timber. Above the water company's intake the watershed has an area of nearly 1½ square miles, on which there is one cabin occupied by one person, and a little traveled mountain road. The cabin is located several hundred feet from the stream. The minimum flow of the stream is reported to be 200,000 gallons a day.

The intake on Trout Run consists of a masonry dam 15 feet long and 2 feet high, built across the stream and a wooden intake box built within the pool. From the intake box water flows through a 6 inch gravity supply main 6,000 feet long, connecting with the 8 inch distributing main from the equalizing reservoir. The elevation of the intake is 522 or about 10 feet higher than the reservoir.

Sitterly Farm Run rises in Rye township on the Sitterly Farm less than 2 miles northwest of the borough and flows thence easterly to and through the borough into the Susquehanna River. The intake is near the source, there being less than ½ square mile of wooded land on the watershed with no cultivation nor habitations, and the minimum flow is reported to be in the neighborhood of 75,000 gallons daily.

The intake on Sitterly Farm Run consists of a dilapidated stone catch basin built in the bed of the stream close above a considerably travelled private road. From the basin, water flows through a 4 inch gravity main about 5,000 feet long leading to and entering at the top of the reservoir. The elevation of the intake is about 50 feet above the equalizing reservoir.

The equalizing and distributing reservoir is located in the western part of the borough. It is of earth construction 75 feet square at the top and 15 feet deep, having a capacity of about 250,000 gallons and an elevation of about 100 feet above the business section of the borough. The inside slopes are 1½ to 1 and the basin is lined throughout with rubble masonry. Surface water cannot enter the reservoir and it is enclosed with a high wood fence. The 8 inch main from the reservoir leaves the basin about 18 inches above the bottom. A six inch blow-off to facilitate draining and cleaning is also provided in the bottom of the basin.

The pumping station is a brick building located on the river bank and in it is installed one Goodrich triplex pump having a 20 H. P. electric motor. The six inch suction pipe, open at the outer end, extends into the river a distance of 500 feet and is below both the Walnut Street and Front Street sewer outlets. The six inch discharge pipe leads to a wooden tank of 30,000 gallons capacity located in the yards of the Pennsylvania Railroad, where the water is used for industrial purposes. There is a 6 inch connection between this force main and the 8 inch distributing main from the reservoir supplying the domestic consumers and by manipulating valves at the pumping station the mountain water may flow into the force main leading from the pump to the railroad company's tank and it is also possible to pump river water into the mains and reservoir. Ordinarily the two mountain streams furnish water to the railroad company's tank during the night and during part of nearly every day the pump is in operation forcing river water to the tank. At such times the valve on the gravity line leading to the storage reservoir is closed. It is reported that river water has not been pumped into the pipes serving the domestic consumers in the past two years.

The distributing system comprises over two miles of pipe ranging in size from two inches to eight inches in diameter and extending throughout the built-up portion of the borough. There are four dead ends in the piping system, and all of these are not provided with fire hydrants. Fire hydrants are otherwise well distributed throughout the system. There are 300 connections to the distributing pipes including the Pennsylvania Railroad. The average daily consumption is reported to be 400,000 gallons. Of this amount 250,000 gallons are used for domestic, 125,000 gallons for industrial and 25,000 for public purposes.

On October 24th and November 4th, 1911, samples of the water supplies were taken and analyzed at the Department laboratories showing the following results:

Date.	Location.	Bacteria per c. c.	
		Total.	B. Coli.
1911.			
Oct. 24	Trout Run intake,	36	0
Nov. 4	Trout Run intake,	60	0
Nov. 4	Sitterley Farm Run intake,	12	0
Nov. 4	Raw river water at pump station,	50	1
Oct. 24	Reservoir,	24	0
Nov. 4	Reservoir,	8	0
Oct. 24	Tap, Garee House,	8	0
Oct. 24	Tap, Geo. Hartmans residence,	24	0
Oct. 24	Tap, Adams residence,	30	0
Nov. 4	Tap, Platt's pool room,	2	0
Nov. 4	Dead end on piping system,	84	0

Typhoid Fever.

Until October 1911 the borough of Marysville had been fairly free from typhoid fever so it is reported. The State records show that from January 1906 until September 1911 there were 15 cases of which 12 cases occurred during the year 1907. Between October 1st and November 4th, 1911 there occurred 10 cases of typhoid fever in the borough and the history of each of these cases was studied by Department officers.

The investigation by the Department revealed certain prominent facts, namely; first, all of the cases used the public water supply; second, seven cases used public water supply only; third, sixty per cent of the cases were adults; fourth, three cases were probably due to secondary infection.

River water is available for drinking purposes by the men at a number of points in the railroad yards. It is also very possible that in making the daily change of supply for the railroad tanks from the mountain source to the river the valves may have been left partly or wholly open and that some river water containing pathogenic organisms may have thus reached the 8 inch distributing main leading to the reservoir. The evidence collected indicates that the outbreak may have been due to the use of infected river water either directly at the railroad yards or indirectly through the raw water connection with the distributing system or both.

Instructions were given the water company at the time of the investigation to close the by-pass valve securely and seal and lock it. It was further suggested to the water company that if they desired to use the gravity supply for industrial purposes it should be delivered through a separate main to the railroad tank.

Proposed Extension.

In its present application dated November 21st, 1911, the Marysville Water Company represented as follows:

" 'We wish to extend the supply 630 feet further up the same stream in order to give us more head. Our present head being only ten feet above our reservoir. This extension will give us 46 feet more fall.' "

The proposed extensions will consist of a new intake to be built on Trout Run at a point 630 feet up-stream above the present intake. Detailed plans of the intake proposed have not been submitted for approval. From the new intake water will flow through a 6 inch pipe connecting with the existing supply main immediately below the old intake, either or both intakes will be used as occasion demands.

Discussion.

The water from the two mountain watersheds could readily be rendered safe and desirable for domestic use provided proper precautions be taken in systematically patrolling the watershed and maintain sanitary conditions thereon.

The Sitterly Farm Run intake should be rebuilt further above the private road and every precaution should be taken to prevent access to the stream above it. To this end it would be preferable to enclose and roof over the new intake.

The practice of using river water for drinking purposes in the railroad yards should be absolutely discontinued. At the close of the recent investigation in November 1911 the following communication was issued.

"J. C. M. Geib,
Supt. of Towers, P. R. R. Co.,
Marysville, Pa.

"Dear Sir:—

During a recent investigation of the Marysville Water Company by representatives of this Department, it was ascertained that raw Susquehanna River water was pumped into a tank in the railroad yards at Marysville for industrial purposes, and the employees in the yards had access to this water for drinking purposes. The use of the river water for drinking purposes without complete purification is a dangerous practice, prejudicial to the public health, and your employees should be notified of the danger of using this water. Each faucet should be placarded and you should take up the matter of supplying a pure and wholesome water supply to the employees, with the Pennsylvania Railroad officials.

Department officers have placed warning signs on numerous faucets about the yards and in case any have been overlooked it is well to take every precaution and placard them also. Under separate cover we are mailing you six danger signs for this purpose.

"Yours very truly,

(Signed) Samuel G. Dixon."

The Department sees no necessity for recourse to the Susquehanna River for water for domestic purposes or for fire protection, since there is opportunity in the mountain on Trout Run at an elevation high enough to give adequate pressure for the storage of sufficient water for fire purposes and domestic consumption. The company should employ an engineer to select the most favorable site for a dam for the proper development of the tributary area and these plans should be submitted to the Commissioner of Health for approval and when the reservoir is built, then all connection should be absolutely severed between the river water and the water works system for the supply of water for domestic or fire purposes to the community.

The Department has concluded that the water for industrial purposes may continue to be pumped from the Susquehanna River to the tank in the railroad yards under strict regulation whereby its delivery throughout the yards and shops is under conditions that render it impossible for any person to drink the water without knowing the danger of so doing.

Meantime, and until the mountain reservoir is constructed and put in operation, the water company shall draw the water from the river for industrial purposes and for fire protection, (in the event of a fire demanding the use of river water) from a point in the river above the upper sewer outlet at Walnut Street and the company should continue to take the water from this up-stream point as long as the river water is used for industrial purposes and plans therefor should be submitted to the Commissioner of Health for approval.

27. TYPHOID FEVER AT MILLVALE.

An investigation of a typhoid fever out break at Millvale, Allgeheny County was begun by the engineering Division on August 15th, 1911. Assistant Engineer Irwin was assigned to the work and he prepared the following report:

General Conditions.

The borough of Millvale was incorporated February 14th, 1868. The incorporated area lies on the west bank of the Allegheny River and is adjacent to the 24th Ward of Greater Pittsburgh. The 24th Ward of Pittsburgh forms a part of the southern boundary. The remainder of the southern and western boundaries of the borough is formed by Reserve Township. It is bounded on the north and east by Shaler Township. In 1900 the borough had a population of 6,736, and in 1910 it was 7,861. A highway bridge over the Allegheny River connects the borough directly with Pittsburgh. The West Penn Branch of the Pennsylvania Railroad passes between the built-up section of the borough and the river. Excellent trolley service is given by several lines of the Pittsburgh Railways Company.

Millvale has a river frontage of one mile and extends north from the river for a distance of one and one-half miles. The incorporated territory is irregular in shape and comprises about 400 acres. At the down-stream end of Millvale where it joins Pittsburgh the borough territory narrows to a strip about 800 feet wide and extending up-stream from the Pittsburgh City line a distance of a half mile. The balance of the borough lies in the valley of Girtys Run, which empties into the Allegheny River about 400 feet below the eastern boundary line. Along the run just back from the river the town widens, spreading out to the east and west, including in this district the most thickly settled part of the town as well as the business section. Beyond this along the valley of the run to the northern borough line, the municipal territory again becomes narrow, comprising a strip of land 1,500 feet wide and ¾ of a mile long.

The town is compactly built in a valley through which Girty's Run flows, flanked by high hills to the east and west. At the down-stream end of the borough the hills come down close to the river, the ledge along the river being taken up by the railroad tracks and one main street which extends parallel to the river. The town site is comparatively flat with the hills to the east and west rising above the town from 100 to 200 feet. These hills are now being laid out in lots and many dwellings have already been completed.

The drainage is into Girty's Run. This stream rises in McCandless Township, Allegheny County, several miles northwest of Millvale. It drains a small portion of the southern section of McCandless Township, the eastern half of Ross Township and the southwestern corner of Shaler Township. It has a watershed of about 10 square miles, chiefly agricultural territory and largely under cultivation. Four miles above Millvale it passes the Borough of Westview, a town of about 1,700 persons. Girty's Run enters Millvale at the extreme northern end of the town and flows thence in a general southerly direction through the most thickly built-up section of the borough and a mile and a half to the Allegheny River. About ½ mile above its mouth, near the intersection of North and Grant Avenues, it receives a small tributary draining the western central section of the borough. It pursues a winding course through the town, confined through the most part in an open, artificial channel. The stream is swift and is said to be subject to sudden rises during heavy freshets.

The people are mostly of German extraction, are thrifty and industrious. The town, as a whole, presents a good appearance. There are possibly over 1,600 buildings, most of which are of frame construction. The average dwelling is 2½ or 3 stories in height. Sixty per cent of the streets are paved. Permanent sidewalks have been laid and public illumination is furnished from the municipal electric light plant, located in the borough pumping station.

Sanitary Conditions.

The borough has no comprehensive sewerage system. A decree relative to sewerage was issued to the borough of Millvale by the Department of Health on October 10th, 1910, and at the present time a comprehensive sewerage system and sewage disposal works are under consideration. Much sewage from the borough and built-up section above the borough enters Girty's Run and presents a very unsanitary condition.

Typhoid Fever.

According to the records of the Bureau of Vital Statistics, no typhoid fever has been reported from Millvale until 1911. This does not mean that there has been no typhoid, but the borough authorities have failed to make reports concerning the existence of typhoid fever. To August 15th, 1911, the cases reported to the Bureau of Vital Statistics were by months as follows:

January,	1
July,	18
August,	5 (to the 15th)
	24

In conducting the investigation concerning the prevalence of typhoid fever in Millvale, all cases reported to the local Board of Health were investigated. A total of 32 cases were visited and a record obtained concerning each. These cases were distributed in all parts of the borough and in no case was one locality more afflicted than another. Cases occurred on the elevated hillside as well as in the low land along Girty's Run.

The following table gives the cases according to age and sex:

Age.	Male.	Female.	Total.
0 to 4,	0	0	0
5 to 9,	0	1	1
10 to 14,	2	1	3
15 to 19,	3	0	3
20 to 24,	1	0	1
25 to 29,	1	3	4
30 to 34,	1	0	1
35 to 39,	4	2	6
40 to 44,	6	4	10
45 to 50,	....	2	2
50 and over,	0	1	1
Total,	18	14	32

The date of onset of the 32 cases investigated is shown in the following table:

DATE OF ONSET.

June 16,	1
June 30,	1
July 1,	3
July 4,	1
July 5,	1
July 6,	1
July 8,	1
July 11,	2
July 15,	2
July 16,	1
July 20,	4
July 22,	1
July 25,	2
July 28,	1
July 29,	1
August 2,	4
August 3,	1
August 4,	1
August 5,	1
August 6,	1
August 8,	1
	32

The occupation of those having typhoid fever are as follows:

Pupils,	12
Children,	4
Laborers,	4
At Home,	4
Housewives,	2
R. R. Engineer,	1
Teamster,	1
Clerk,	1
Baker,	1
Machinist,	1
Coppersmith,	1
	32

Regarding the use of ice cream, the following data was obtained:

Ricks Ice Cream Company of Pittsburgh furnished many drug stores and ice cream parlors in Millvale and the number obtaining ice cream from this source was,	11
Pfenders, a local dealer,	2
Oswalds,	1
Uhls,	2
At a picnic,	1
No ice cream,	15
	32

The milk supply for the 32 typhoid fever patients was obtained from 20 distinct sources. The dealers supplying the larger number of patients are Boltz 4, Lisinger 4, Naugle 4. These three dealers have large milk routes and each supply over 100 customers.

The water supply obtained by the 32 patients was as follows:

Borough public supply only,	21
Dug well water only,	3
Distilled water only,	1
Borough public supply with other supply,	7

Dug well water with borough supply,	3
Drilled well with borough water,	1
Spring water with borough water,	1
Pittsburgh filtered water with borough water,	1
Distilled water with borough water,	1
	7

Public Water Supply.

The public water supply is obtained from the Allegheny River by way of a crib, pumped directly into the distributing system and the surplus stored in a distributing tank located on the hillside in Reserve Township.

The water works was built in 1893. The pumping station is located on the western bank of the Allegheny River a little to the south of the foot of Grant Street. The intake is directly out in the river about 400 feet from the pumping station. It is located but a short distance from and below the second pier of the highway bridge connecting Millvale with Pittsburgh. According to Mr. John Wallace, Chairman of the Water Committee of Council, who says he constructed the crib now in use, the crib was built about 12 years ago and is 80 feet by 16 feet by 4 feet and is covered with stone and gravel and sand to a depth of about 12 feet. Much sand is said to be deposited in the river in the neighborhood of the crib and often sand barges take away the sand leaving holes that are gradually filled. The sand in this way is kept moving on the river bottom and it has been necessary to often add sand to the crib covering to keep sufficient material over the coarse inner structure that clear water may be obtained for the borough. Also the boat channel is located about 100 feet east of the crib and this channel it is said, tends to keep the sand at the higher level moving toward it, and in this way affects the sand placed above the crib. A 16 inch cast iron intake pipe leads direct from the crib to the pumping station.

The pumping station is of brick construction, housing two tubular, horizontal boilers, two perpendicular steam driven pumps and two dynamos for the generating of alternate and direct current for municipal lighting purposes. The pumps each have a capacity of 2,000,000 gallons and have been in service 18 and 3 years respectively. Both pumps are attached to the 16 inch intake and each is connected to the 12 inch discharge main. The 12 inch discharge main on leaving the pumping station, crosses Ohio Street and runs up Grant Street until it reaches the intersection of Grant and North Streets. At this point it turns up Howard Street a short distance to Gerwig Street and on reaching the end of Gerwig Street crosses lots until the storage tank is reached. This force main is 12 inches throughout, about ¾ of a mile in length and is connected with many of the cross streets on its way to the storage tank. Thus the storage tank, which has but the one pipe connection, receives only the surplus from the distributing system. The distributing mains on streets conecting with and running at right angles to Grant Street, are usually 6 inch mains and feed into 4 inch mains for streets running parallel to Grant Street. An 8 inch connection is made to the 12 inch discharge line as it crosses Ohio Street and this main extends southwesterly on Ohio Street about 3,000 feet.

The built-up sections of the borough are very completely supplied with water, the extensions made at the present time being principally for sections that have but recently been developed. The majority of the distributing system has been in service for 18 years. However, each year extensions are usually made. Recently a 4 inch main was laid in North Avenue and during the Fall of 1910 an extension was made on Williams Street. In no case where extensions have been made has an application been placed before the Commissioner of Health. No extension has been made outside the municipal territory. Four and six inch mains have been used almost exclusively for general street purposes.

The storage tank which is located a short distance outside the borough in Reserve Township, is 50 feet in diameter and 30 feet high having a capacity of about 440,000 gallons. It is located at such an elevation that the water pressure at the pumping station is 130 pounds. It is said that but little deposit is ever found in the standpipe. This is probably because the tank receives only surplus water from the distributing main. The water would usually stand in the mains some time before reaching the tank.

Relatively speaking, the whole borough receives the public water supply. Probably not over 10 wells exist and few springs are in use.

The total consumption is estimated to be 1,300,000 to 1,400,000 gallons for 24 hours and of this amount it is said that probably 500,000 gallons are used for industrial purposes.

Turbid water was noticed by the consumers during the early part of July. The exact date when the turbid water first appeared could not be ascertained, but it was said by many that they first noticed the change in color of the water between the first and fifth of July. This turbid condition existed until August 12th. From August 10th to the 12th inclusive, 10 boat loads of sand were placed over the crib in the river. It is said the sand was not placed sooner because it had been impossible to engage sand diggers to do the work. It is thought that the sand was not removed from the crib at any one time, but had been for some time previous to July 1st constantly being carried away and gradually the efficiency of the sand covering decreased and raw river water was admitted to such an extent that little or no turbidity was removed. The consumers, after the turbidity of the water became continuous in a marked degree, began to boil the borough water supply when it was impossible to secure other supplies and to obtain well and spring water or purchase bottled water when possible. In this way the effect of the raw river water was probably materially decreased. Sand dredgers will often secure large quantities of sand from points near the crib before they are noticed by the borough officials and when sand is removed from points directly below the crib it is impossible to retain proper depth of sand over the crib. An effort is being made to secure protection from the U. S. Government by having regulations adopted regarding the removal of sand from the river in the neighborhood of the Millvale intake.

Conclusions.

It is apparent that the depth of sand over the intake of the Millvale public water works is not a constant known quantity. There is no way of knowing at all times the condition of the intake and until turbid water is obtained by the consumers, it is the custom to pay little or no attention to the condition of the intake. To obtain a knowledge of the bacterial content of the public water supply, samples were obtained on August 16th and 17th, the results being as follows:

	Bacteria per c. c.	B. Coli per c. c.
August 16th.		
No. 1 Tap at pump house, Millvale,	15000	7
No. 2 Tap at pump house, Millvale,	4500	12
No. 3 Tap, Pfeifer Livery, Millvale,	3600	8
No. 4 Tap, No. 11, Settrick St., Millvale,	7200	10
No. 5 Tap, 325 Evergreen St., Millvale,	5760	20
No. 6 Tap, Adams Express, Millvale,	10800	24
August 17th.		
No. 7 Tap, pump station, Millvale,	1800	2
No. 8 Tap, pump station, Millvale,	1200	6
No. 9 Tap, 150 Sherman Ave., Millvale,	2100	12
No. 10 Tap, 207 Sedwick St., Millvale,	800	10
No. 11 Tap, No. 9, Sedwick St., Millvale,	3200	30

As the work of improving the crib was completed only on July 12th and little was known of the efficiency of the work, it was thought advisable to treat the water with a disinfectant. A temporary apparatus was set up and on August 19th the water was treated with 8 pounds of chlorinated lime to one million gallons. The water works superintendent and employees of the pumping station were instructed in regard to the use of the lime and the treatment was to be continuous and carefully regulated. The water works pumping station was in operation almost contiuously day and night and the chlorinated lime apparatus was so constructed that either pump would receive the treated water as it was drawn through the suction main, the lime solution being added to the suction main a short distance before it entered the pumps. The following week on Monday and Tuesday other samples were collected from the public water supply to show the effect of the chlorinated lime treatment.

	Bacteria per c. c.	B. Coli per c. c.
August 21st, 1911.		
No. 6 P. R. R. Depot at Millvale Station, Allegheny County,	84	0
No. 1 At pumping station on Allegheny River, of Millvale Water Light Co., Bridge St.,	140	1
No. 5 Ingold, 309 Grant Ave.,	500	2
No. 2 210 Lincoln Ave.,	140	4
No. 3 John Pail, 117 Sherman St.,	36	0
No. 4 John Steuler, 321 Grant Ave.,	1200	0
August 22nd, 1911.		
No. 1 Mrs. Leon Brown, (residence), 257 Maryland Ave.,	280	0
No. 2 M. E. Maddell, 116 Rutter St.,	9000	12
No. 3 P. J. Bauer, 423 Grant Ave.,	20	0
No. 4 Frank Cherbrock, 416 Sample St.,	6	0
No. 5 Max Rothe, 527 North Ave.,	12	0
No. 6 C. Neuf, 616 Eevergreen Ave.,	24	0

It was judged by results of these samples that the chlorinated lime treatment was not receiving proper attention. The Chairman of the Water Committee and the water works superintendent were informed regarding this point.

The local authorities will be ordered to maintain the chlorinated lime plant and operate it efficiently and if this does not produce a satisfactory results the borough will be compelled to install a modern filtration plant.

28. TYPHOID FEVER AT MONTGOMERY.

In the autumn of 1911 typhoid fever appeared in the Borough of Montgomery, Lycoming County, Pennsylvania. The public water was suspected and Assistant Engineer Ennis was assigned to make an investigation of the water works system. Dr. Hunt, the Department's Associate Chief Medical Inspector was on the ground in charge. Mr. Ennis installed a temporary chemical sterilizing plant for the treatment of the Borough's water. His report of the operations of the Engineering Division, is as follows:

The borough of Montgomery is a manufacturing and residential community of 1490 population located on the north bank of the West Branch of the Susquehanna River in Lycoming County, about 15 miles down stream below the city of Williamsport. In 1900 the population was 1063.

The principal industrial plant is that of the American Wood Working Machine Company. There is also the plant of the Montgomery Door and Sash Company, The Montgomery Table Works. The Deutchle Planing Mill, The Penn Manufacturing Company and several small plants, all of which employ upward of 500 hands.

The town is on the main line of the Philadelphia and Erie Division of the Pennsylvania Railroad and on a Branch of the Philadelphia and Reading Railway, both leading to Williamsport City. Montgomery was incorporated in 1887 out of Clinton Township which township surrounds the Borough.

The municipal territory is irregular in shape and abuts on the river for a distance of about a mile and extends back therefrom over a mile. Coming down through its centre and entering the river about a quarter of a mile below the borough is Black Hole Creek, a stream having its source in the Bald Eagle Mountains, 4 miles northerly. This creek passes between two high hills in Montgomery. The railroads parallel the river and are back therefrom one half mile. The two hills are north of the railroad. Montgomery Street, the principal thoroughfare in the town, parallels the Pennsylvania Railroad and is immediately north of it extending westerly from Main Street. Main Street begins at the river and extends northerly, passing up the valley of Black Hole Creek out in Clinton Township. The portion of Main Street north of Montgomery Street is on the hillside, the summit of which lies between Main Street and Montgomery Street in the northeastern portion of the Borough. The best residences of the borough are on the hill. The stores are along Main Street in this district. West of Black Hole Creek is the other high hill on which there are quite a number of residences.

South of the railroads and paralleling them is Broad Street which starts from Main Street and extends easterly. This district and the lateral streets therein are on the flats, so called, but the land is above freshet flow. Nothing but residences are built in this district except manufactories which are located all along both railroads in the town.

Extending through the flats near the river is Spring Mill Creek, a small stream which rises in the township and after flowing along the river it enters the river just inside of the borough limits at the south east corner.

The only land in the town subject to inundation is that abutting both creeks in the south western corner west of Main Street and south of the railroads.

There are a few public sewers and many private sewers in the borough serving a number of inhabitants. The sewage is also disposed of in cesspools and privy vaults. There are about 80 of the former and 132 of the latter in use. There are two private water works systems in the borough which supply water to many of the inhabitants. Aside from this, water is obtained from 100 dug and drilled wells and a few private springs.

Existing Sewerage.

Prior to 1908 there was only one public sewer in the borough, consisting of about 2,400 feet of 15 inch reducing to 6 inch diameter terra cotta pipe extending from its outlet into Black Hole Creek near the Pennsylvania Railroad culvert eastward along Montgomery Street to Decker Street. In 1908 the borough built a sewer on Broad Street and in October 1911 a sewer was in course of construction along Main Street. The Broad Street sewer was approved by the Commissioner of Health in a permit issued September 15th, 1908. Application for approval of the Main Street sewer about to be considered by the Department.

The conditions and stipulations under whcih the Broad Street sewer was approved are as follows:

"FIRST: That all storm water shall be excluded from the sewer.

"SECOND: That the borough shall cause the immediate removal of all overhanging privies on the banks of the streams in the borough.

"THIRD: That on or before the first day of December, nineteen hundred and eight, the borough shall prepare and file with the Commissioner of Health for approval a comprehensive plan for a sanitary sewer system and a sewage disposal works for the collection and purification of all the sewage of the borough, and these plans shall be accompanied with a report and estimates of cost. The Commissioner of Health will modify, amend or approve the plans and fix a time when they shall be constructed, having in mind the date when other municipalities along the west bank of the Susquehanna River shall be required to treat their respective sewages.

"FOURTH: This permit shall cease on December first, nineteen hundred and eight, but if on said date the borough shall have complied with the terms herein stipulated, then the time in which sewage may continue to be discharged from the borough sewer system into the waters of the State shall be extended."

The Board Street sewer has an outlet into Black Hole Creek below the Philadelphia and Reading Railway tracks opposite the end of Broad Street. It consists of about 2,400 feet of 15 inch reducing to 8 inch terra cotta pipe extending nearly the entire length of the thoroughfare.

The Main Street sewer consists of about 1,000 feet of 15 inch terra cotta pipe extending from its outlet into the Montgomery Street sewer westward along Main Street to Penn Street.

Above the outlet of the Montgomery Street sewer along Black Hole Creek there are about 30 private sewers whose diameters range from 4 inches to 8 inches which empty into the stream below a dam built in the creek. These outlets are all in the eastern section of the borough. The Main Street sewer was built for the purpose of intercepting all of the private sewers and to improve the sanitary conditions along the creek's bank.

In the western section of the Borough there are two private sewers which empty into Black Hole Creek. One is a 6 inch pipe 500 feet long serving 6 houses and entering the stream at the foot of West Houston Avenue. The other is an 18 inch pipe originally 1,000 feet long and used as a storm drain. It empties into the creek opposite Penn Street. Later 1,500 feet of 6 inch terra cotta pipe was laid and connected to the 18 inch line. Now there are about 12 houses located on the hill which are served through this 18 inch outlet. Altogether there are about 129 houses connected to the public sewers and 42 houses served through the private sewers. The very small amount of manufactural wastes at the industrial plants is disposed of into cesspools.

Existing Water Works.

The inhabitants of the borough of Montgomery are supplied with water by the Montgomery Water Company and a private unincorporated water company owned by Dr. J. F. Gordner and other residents of the town.

The Montgomery Water Company was chartered September 13th, 1897 for the purpose of supplying water to the public in the borough of Montgomery and to those desiring the same in the adjacent territory. The works were built the same year and the water supply was obtained from Black Hole Creek until 1905 when an additional water supply was obtained from drilled wells. The water works system comprises a filter crib, pumping station, force and distributing mains and a storage reservoir.

The Black Hole Creek supply is obtained within the borough at a point about 500 feet south of the northern borough line and below the natural drainage from a small portion of the town. A dam of wooden construction 30 feet long and 6 feet high located just north of the borough line is constructed in the stream and is used in connection with the water works. Above the water company's intake and dam the watershed of the creek has an area of nearly 18 square miles on which are 198 properties and a population approximating 900 including about 90 inhabitants in the borough. Farming is extensively engaged in on the watershed and it is only sparsely wooded. The stream is subject to quick rises after rainfall and is invariably quite turbid at such times. The flow of the stream is not known but is reported to be seriously affected by droughts.

The drilled wells, two in number, are flowing wells located opposite the creek intake and about 40 feet from the eastern bank of the creek. The wells are 8 inches in diameter drilled through the shale and slate rock to a depth of 208 and 230 feet respectively. The casing pipes extend 16 feet below the ground surface into solid rock. The combined flow of the wells is about 45,000 gallons in 24 hours, or about three-fifths of the daily supply.

The filter crib is located in the bed of the creek near the eastern bank, upstream and above the outlets of the sewers in the borough. This crib is 24 feet long, 9 feet wide and 9 feet deep filled with broken stone and gravel its entire depth. After passing through the filtering material in the crib the water flows through a 6-inch pipe about 20 feet long to a pump well or so called filtered water basin.

The pump well is of masonry construction 12 feet in diameter by 12 feet deep. The side walls extend above the ground surface to exclude surface wash and a substantial roof is provided to prevent chance or malicious pollution.

The pumping station is a brick building located on the eastern bank of the creek opposite the filter crib. The pumping machinery consists of one Smith-Vail triplex pump having a rated capacity of 175,000 gallons in 24 hours. The pump is usually operated by a 12-foot water wheel which is fed by a 24-inch wooden flume extending 500 feet up-stream to the dam. There is one 10 horse power auxiliary gasoline engine and also one 20 horse power electric motor in the pumping station.

The pump suction, 6 inches in diameter, extends into a masonry valve chamber outside of the pump house thence into the so-called filtered water well. The flow from the drilled wells is through 5-inch pipes connected to the 6-inch suction line in the valve chamber. By manipulating valves on these various lines any source of water supply may be cut out. Usually the 3 sources are in use. The discharge of the pump is into a 6-inch force main connected to the distributing system and the overflow from the distributing system is into the storage reservoir.

The storage reservoir is located on the hillside in Clinton Township just east of the borough line at an elevation of 247 feet above the business section of the town. The reservoir is of earth construction 75 feet long by 75 feet wide at the top having a depth of 12 feet at the flow line and a capacity of about one-half million gallons. The inside slopes of the reservoir are 1½ to 1 and it is lined throughout with dry rubble masonry. Surface water cannot enter the basin and it is enclosed by a wooden fence, part of which has been torn down. The inlet pipe to the reservoir is 8 inches in diameter and is elevated slightly above the bottom. A 4-inch blow-off pipe is provided in the bottom for cleaning.

The distributing system comprises about 4 miles of pipe ranging in size from 4 inches to 6 inches in diameter. The greater portion of the pipes are of the 4 inch size. There are 7 dead ends in the piping system, two of which are provided with fire hydrants. Fire hydrants are otherwise fairly well distributed. There are 283 connections to the distributing pipes including nearly all of the industries. The maximum daily consumption is about 100,000 gallons for all purposes.

Private Water Supplies.

The water supply of the unincorporated company owned by Dr. J. F. Gordner and others comprises a storage reservoir and gravity supply main. The source of water supply is a spring located on the mountain side in Clinton Township. The watershed above the spring comprises less than one quarter of a square mile of cultivated and only partly wooded land which is uninhabited.

The spring has its origin in shale formation and is enclosed in a substantial masonry structure roofed over and properly protected. From the spring enclosure water flows through a 4-inch gravity supply main nearly one mile long extending along the public road in the township and Houston Avenue in the borough, terminating at Main Street. There are 12 dwellings and one hotel in the borough connected to the supply pipe.

The American Wood Working Machine Company obtains its water supply from a spring on the hillside above Johnson Street in the borough. There are no houses above the spring. The spring is enclosed in a dilapidated building and water is piped from the enclosure through a 2-inch pipe 400 feet long to the works.

The Montgomery Table Company has a private system for fire protection. The source of supply is a dug well on the Company's property and the water is pumped into a 300,000 gallons reservoir, distant one-quarter of a mile and located on the hillside near Penn Street in the north-western part of the borough.

Typhoid Fever.

The borough has been reasonably free of typhoid fever in the past. The State records show only two cases as having occurred in the past five years prior to 1911. From the first of January, 1911, until June first, there were nine cases reported and between June first and October tenth there were 24 cases in the town and one case in the township adjoining. This large increase in fever alarmed the local health officials and this Department was requested to assist the local health authorities.

Because of the suspicious character of the Black Hole Creek water as well as the various ground water supplies throughout the town, the local health board had already notified the public to boil all water used for domestic purposes. The milk was also ordered boiled. The local health officers had already conducted a sanitary investigation about the town and a general cleaning up had been effected when the State representatives arrived. The precautions already adopted were recommended continued by the State officers and an investigation as to the cause of the outbreak was started. Dr. Hunt took charge of the medical part of the investigation and Inspector Zeigler and Engineer Ennis investigated the water and milk supplies as well as the general sanitary conditions. A chemical dosing apparatus was installed at the pumping station and the water supply was disinfected with hypo-chlorite of lime. This treatment of the water has been continued, with one or two exceptions, to date. The water in the reservoir was disinfected with copper sulphate immediately and later the reservoir was drained and thoroughly cleaned and disinfected. All the fire hydrants in the piping system were opened and the mains thoroughly flushed with treated water for several hours.

Department officers had already conducted a sanitary inspection and re-inspection of the watershed of Black Hole Creek above the Water Company's intake. The re-inspection was completed on November 3rd, 1911, and the sanitary conditions were not again re-inspected. According to the reports of the Department inspectors as well as the Department Health Officer in charge of the townships on the watershed of the creek, there had not been any typhoid fever on the watershed between January 1st and October 8th, 1911. However, up to about July 1st there were 45 pollutions on 17 properties on the watershed. Notices of abatement were served on all of these properties and on November 3rd, seven pollutions still existed.

The facts relative to the typhoid fever cases appear in the following table:

Date of onset.	Name of Patient.	Address.	Age.	Occupation.	Water Supply.				Sewage Disposal.		Milk.
					Spring.	Well.	Mont. W. Co.	Privy.	Cesspool.	Sewer.	
June 9	Edward Pysher, ...	Main St., ...	41	Mont. Table Wks.,...	....	Well	Mont. W. Co.	Privy	....	....	Own cow.
June 23	Mrs. Sylvester Feaster,	Main St., ...	69	Housewife,............	....	Well	Mont. W. Co.	Privy	....	....	Own cow.
Aug. 1	Charles Golder, ...	Main St., ...	12	School,................	....	Well	Mont. W. Co.	Privy	....	....	Metzger,
Aug. 2	Maud Klingerman, ...	Bower St., ..	3	At home,..............	....	......	Mont. W. Co.	Privy	....	....	Decker.
Aug. 27	Ray Nuss, ...	Johnson St., .	40	Houston Machine Co.,.	Spring	......	Mont. W. Co.	Privy	....	....	Decker.
Aug. 27	David Knuan, ...	Clinton Twp.,	26	Driver (Mont. Boro),.	....	Well	Mont. W. Co.	Privy	....	....	Thomas.
Aug. 28	Otis Shuman, ...	Broad St., ...	35	Houston Machine Co.,.	....	Well	Mont. W. Co.	......	....	Sewer	Fritz.
Sept. 10	Mrs. Harry Paff, ...	Main St., ...	40	Housewife,............	....	......	Mont. W. Co.	Privy	....	....	Decker.
Sept. 12	John Jamison, ...	Broad St., ..	40	Planing Mill,..........	Spring	Well	Mont. W. Co.	Privy	....	....	Decker.
Sept. 20	Oliver Muxel, ...	Houston Av.,	50	In business,...........	....	Well	Mont. W. Co.	......	....	Sewer	Metzger.
Sept. 20	Mrs. Ada Ward, ...	Main St., ...	53	Housewife,............	....	Well	Mont. W. Co.	......	....	Sewer	Fritz.
Sept. 23	Chas. Bender, ...	Broad St., ...	24	Mont. Table Wks.,...	....	Well	Mont. W. Co.	Privy	....	....	Thomas.
Sept. 26	Howard Beal, ...	Houston Av.,	36	Mont. Elec. Light Co.	....	Well	Mont. W. Co.	Privy	....	....	Dunn.
Sept. 26	Wess Decker, ...	Houston Av.,	13	School,................	....	......	Mont. W. Co.	......	....	Sewer	Own cow.
Sept. 27	Thos. Aunkst, ...	Main St., ...	15	Bean Shirt Factory,..	....	......	Mont. W. Co.	Privy	....	....	Dunn.
Sept. 27	J. W. Henderson, ...	Houston Av.,	21	Student,...............	various	......	Mont. W. Co.	......	....	Sewer	Metzger and Decker.
Sept. 28	Nelson Askey, ...	High St., ...	24	Penn Mfg. Co.,........	....	Well	Mont. W. Co.	Privy	....	....	Metzger and Decker.
Sept. 28	Geneva Decker, ...	Houston Av.,	17	School,................	....	......	Mont. W. Co.	......	....	Sewer	Own cow.
Sept. 28	W. H. Mull, ...	First St., ...	49	Houston Machine Co.,.	Spring	Well	Mont. W. Co.	Privy	....	....	Dunn.
Sept. 28	C. H. Matter, ...	Broad St., ...	41	P. & R. R.,...........	....	Well	Mont. W. Co.	......	....	Sewer	Decker.
Sept. 29	Mrs. Frank Kelly, ...	Main St., ...	47	Housewife,............	....	Well	Mont. W. Co.	......	....	Sewer	Fritz.
Sept. 29	Madge Fowler, ...	Bower St., ...	17	School,................	....	Well	Mont. W. Co.	Privy	....	....	Metzger.
Sept. 30	J. E. Calvin, ...	Kinsey Ave., .	37	Minister,..............	....	Well	Mont. W. Co.	......	....	Sewer	Dunn.
Oct. 1	Mrs. Wm. Sherman, ..	Bower St., ...	37	Housewife,............	Spring	......	Mont. W. Co.	......	....	Sewer	Decker.
Oct. 6	Lester Burrows, ...	Main St., ...	20	Store,..................	....	Well	Mont. W. Co.	Privy	....	....	Decker.

The results of the Department's investigation revealed certain prominent facts, namely, first, all the cases with two exceptions used the Montgomery Water Company's supply; second, 40 per cent. of the cases used this Company's supply only; third, nearly 30 per cent. of the cases used water from wells dug from sand formation and located in close proximity to Black Hole Creek, of this number the two cases that did not drink the Montgomery Water Company supply are included; fourth, only 4 per cent. of the cases were under 5 years and only 24 per cent. of the cases were under 19 years of age; fifth, the cases were not confined to one territory but were scattered throughout the borough.

The following tables will show the results of bacteriological examinations made in the Department's laboratories of the various water supplies about the borough:

Date of Collection.	Location. Montgomery Water Co.	Bacteria per c. c.	
		Total.	B. Coli.
Oct. 9	Drilled well,	2	0
	Pump well,	160	6
	Raw Black Hole Creek,	100	21
	Water at pumping station tap,	24	0
	Reservoir,	20	0
	Tap,	12	0
Oct. 10	Pump well,	100	4
	Raw Black Hole Creek.	60	6
	Tap on pump,	20	4
	Tap on pump,	24	1
	Raw Black Hole Creek,	30	8
	Tap,	60	1
	Tap,	210	0
	Tap,	12	0
Oct. 11	Tap,	12	0
	Tap,	60	4
	Tap,	24	0
	Black Hole Creek water,	20	4
	Tap on pump,	3500000	140

Date of Collection.	Location. Various Supplies.	Bacteria per c. c.	
		Total.	B. Coli.
Oct. 9	F. G. Kelley dug well,	240	12
	Decker drilled well, Penn and Brook Sts.,	60	2
	American Woodwork and Machine Co.,	10	0
	A. G. Decker dug well, Main and Broad Sts.,	6	0
	Drilled well, Montgomery Table Works,	14	0
	Tap Dr. Gordner spring supply,	10	0
Oct. 10	John Harris spring,	10	0
	Dug well, Leddick property, Main St.,	60	10
	Dug well, Isaac Decker property, West Brook St.,	40	10
	Dug well, Chas. Dewalt, N. Main St.,	20	1
	Dug well, O. H. Meixle, Houston Ave.,	80	1
	Drilled well, Penn Furniture Co.,	6	0
	Dug well, Wm. Mell, First St.,	80	1
	Dug well, John Jamison, Main and Broad Sts.,	10	1
	Spring on Dr. A. P. Hull property, Bower and Houston St.,	3	0
	Dug well, Decker property, Second and Broad Sts.,	16	0
Oct. 11	Dug well, Samuel Sheasley property, Broad St.,	10	0
	Drilled well, Montgomery Hotel,	3	0
	Drilled well, W. E. Frey,	6	0
	Dug well, Oliver Bear,	2	0
	Dug well, E. E. Best, Main St.,	120	12
	Dug well, O. H. Hilliard,	10	0
	Dug well, Ray Hain,	40	4

With respect to the Montgomery Water Company's supply from Black Hole Creek being the medium of transmission of infection, it appears from what has hereinbefore been stated that it likely was the medium of the infection. That more fever did not occur among the water company's consumers and the fact that the onsets of the cases were spread over such a long period of time is not easily accounted for. However, with the June cases eliminated, it is fair to assume that the later cases were infected with Black Hole Creek water. Sewage pollution evidently pased through the filter crib in the creek without receiving any purification and was delivered into the so-called filtered water basin or pump well where it no doubt lurked for a considerable time. In consequence any pathogenic organism existing in the pump well water would continue to contaminate the drilled well water with which it was mixed for a number of days. If this reasoning be correct the infection of the water supply would be more likely to be of a milder type and in consequence there would follow a less percentage of cases outbreaking among the Water Company's consumers.

With respect to the milk supply, there are 5 principal milk venders obtaining their milk supply at their own dairies. Each dairy was visited and found in a fairly food sanitary condition. There was no sickness of any kind at the dairies visited during this year and no typhoid fever at any of the places in the past ten years.

The ice supply of the borough is obtained from a dam on a small mountain stream located in Clinton Township northwest of the borough. The stream flows through a farming territory and receives surface wash and barnyard drainage from at least five farmsteads.

Mr. Ennis was instructed to notify the Montgomery Water Company on behalf of the Commissioner of Health that it must make permanent improvements to its water supply, comprising among other things the installation of a permanent water purification plant. At the close of the year plans were well under way, so it was reported, for the construction early in the ensuing year of the filters.

29. TYPHOID FEVER AT NEW OXFORD.

During the early part of the summer typhoid fever broke out in the borough of New Oxford, Adams County. Assistant Engineer Irwin was sent there to investigate. He installed a germicidal plant for treatment of the water and he prepared a report of his investigations to the Department, which is given in full in the following pages.

General Conditions.

The borough of New Oxford is located in the eastern part of Adams County on the Baltimore and Harrisburg Division of the Western Maryland Railway about nine miles east of Gettysburg. The borough had a population in 1910 of 828. The principal industry is the making of shoes, there being two shoe factories having about two hundred employees. A cigar factory furnishes employment for about fifty of the citizens.

A number of those residing within the borough are engaged in the management of nearby farms. The appearance of the town as a whole is that of a thrifty and industrious community. The incorporated territory comprising a little over one-half square mile is situated at the summit of a gradual eminence which commands a view of the surrounding agricultural country, and facilitates good surface drainage. The business and built-up portion of the town lies to the north of the railroad. There are no paved streets. Cement and stone side walks are laid throughout the greater part of the built up section. The houses are as a rule of wood and brick construction located on spacious lots.

Drainage Facilities.

On April 12th, 1907, The New Oxford Drainage Co. received a permit from the Commissioner of Health to construct a system of sanitary sewers and a sewage disposal. The disposal works was to consist of a septic tank and contact beds, but such a plant was never built. A crude method of percolation and irrigation has been adopted instead. According to the Secretary of the Drainage Company on May 11th, 1911, there were 25 houses connected with this sewer system, having modern improvements such as baths and toilets. There were 5 houses connected for cellar drainage and wash water only. The effluent from the disposal plant installed by the Drainage Company discharges into Oxford Run, which is a tributary of Little Conewago Creek, joining the creek about one-half mile below the intake of the borough water works. Two or three private sewers discharge into Oxford Run. The Drainage Company does not keep the disposal in repair. Tall grass was growing on the sides of the bed and there were a number of holes in the embankment which allowed the sewage to flow almost directly through, there being very little percolation.

There are a few cess pools within the borough but the greater part of the houses not connected with the Drainage Company's sewer system do not have bath and toilet facilities.

The Public Water Works.

The water works system is owned and operated by the borough. The works were built in 1896 and consists of a filter crib located in the bank of Little Conewago Creek to the southeast of the borough, pumping station, force main and distributing system and a stand pipe. Little Conewago Creek rises near the Maryland state line and drains approximately 45 square miles. The total population of the watershed is estimated to be 22,647. There are on the watershed several incorporated municipalities: Hanover, York County; McSherrystown, Adams County, being the principal ones having a population of 7,057 and 1,724 respectively. The surface drainage and the sewage from Hanover, as a whole, is discharged into the Little Conewago Creek. The greater part of the drainage and sewage from McSherrystown also enters this stream.

A sanitary survey of the watershed was being made in 1911 and at the time of inspection over 100 pollutions had been found. Orders of abatement were being issued. The sewage from the borough of Hanover is being treated at a sewage disposal located about six miles above the New Oxford water works intake. The disposal plant which is owned by the Hanover Sewer Company receives but little attention and frequently it becomes necessary to by-pass the sewage about the plant and discharge it directly into the creek. The Commissioner of Health is at the present time taking steps to correct the operation of the sewage disposal at Hanover.

The filter crib and pump station are on the east bank of the Little Conewago Creek and located in New Oxford township. About one-fourth mile below the intake is a dam across the creek which causes slack water as far up the stream as the intake of the water works. The filter crib is hardly worthy the name of a filter, being merely a straining device built principally in the bank of the creek and extending out into the stream. The crib is of wood and masonry construction, 16 feet in length, 10 feet wide and 8 feet deep. The filtering material consists of sand, coke and gravel. The creek water enters at one end through a port one foot square built somewhat above the filtering surface and passes down through the filtering material and thence through a six inch valved pipe to a pump well. The entrance to the crib may be closed by a gate at any time. There is no rate control nor any modern appliance to regulate the operation of the crib and there is no method of cleaning other than the removal of the material.

When the creek is high the water passes over the crib into the well and at such times very turbid water is delivered to the consumers. When the creek is very low the water cannot enter the crib and at such times an emergency intake is used. This emergency raw water intake is laid from the creek to the pump well so that the water may pass into the well directly from the creek. It is stated by the operator at the pumping station that durnig the summer when the creek is low he often uses the raw water intake two or three hours each day.

The pump well which receives the water from the crib is 16 feet in diameter and 16 feet below the ordinary water level of the creek. The side walls extend above the ground surface and above ordinary high water mark. It is provided with a wooden cover.

The pumping station is situated a short distance from the well. It is brick construction and in it is a Seneca Falls triplex pump having a rated capacity of 288,000 gallons. This pump is operated by a 22 h. p. gasoline engine. The suction line of the pump has two connections, one being to the well and the other to the creek. The suction line is equipped with a valve so that either raw or filtered water may be pumped. From the pump a 4 inch discharge line increasing to a 6 inch main extends to the distributing system in the borough, the surplus water passing into the stand pipe. This pump is operated three or four hours a day, depending upon the amount of water consumed.

The distributing system extends practically throughout the built up portion of the borough and comprises about two miles of one, four and six inch pipe, the greater amount of the pipe being of the 4 inch size. There are about six dead ends on the piping system not provided with fire hydrants. Fire hydrants are otherwise fairly well distributed. There are 150 connections to the distributing pipes serving about 600 consumers. The daily consumption varies from 50 to 90 thousand gallons. Extensions have been made to the distributing system whenever the Council deemed advisable and the extension was made without receiving a permit from the Commissioner of Health. In 1910, 588 feet of 4 inch main were laid on Pleasant Street, 60 feet of 4 inch main on Carlisle Street and numerous other extensions about the borough.

The stand pipe is located on an elevated plateau in the highest parts of the borough, and consists of a steel tank 16 feet in diameter by 80 feet high, having a capacity of about 100,000 gallons. The elevation of the bottom of the tank is about 100 feet above the floor of the pump house.

On May 8th I called upon the Chairman of the Water Committee of Council and in company with him made an inspection of the intake, crib, and pump station. It was found that the creek water was turbid, that the water was not clarified as it passed into the pump well as some of the creek water was passing over the crib and entering the well direct. In the evening of May 8th a meeting of the Water Committee of Council was held and it was decided that the public water supply should be treated with copper sulphate as a sterilizing agent. It was determined by the Water Committee that the public water supply was a dangerous one because of the discharge of sewage into the stream above the intake and because of the inefficiency of the filter crib to remove turbidity from the water. On May 9th a temporary apparatus was installed for the use of copper sulphate. This apparatus consisted of two barrels, one for mixing and the other for feeding the chemicals. The feed barrel was connected with the suction pipe and two parts of copper sulphate by weight were added to each million gallons of water in the suction line immediately before it entered the pump. The rate feed was regulated by a hand operated valve. The rate of the pump being constant there was little trouble in feeding the solution accurately and constantly. Records of the operation of the pump station were kept by the operator for use by the Department at any time. On the morning of May 10th samples of water were collected of the raw water at the intake and from taps about the borough. The creek water at this time was slightly turbid, due to recent rains. On August 7th samples were collected of raw and treated water when the creek was swollen with flood water due to a very heavy rain. On September 5th other samples were collected when the creek was slightly above normal.

The following table shows the date of collection and the bacterial content of samples as analyzed at the Department's laboratory:

Date of collection.	Sample.	Total Bacteria	B. Coli.
1911:			
May 10th	Intake pump station,	800	3
May 10th	Intake pump station,	560	0
May 10th	Tap, railroad station,	30	0
May 10th	Tap, Harvey Dunkel residence,	36	0
May 10th	Tap, Weaver Foundry,	24	0
May 10th	Tap, Eagle Hotel,	30	0
May 10th	Tap, M. D. Feiser residence,	20	0
June 29th	Intake pump station,	30	5
June 29th	Intake pump station,	350	4
June 29th	Tap, Roy Taughinbaugh residence,	14	0
June 29th	Tap, Weaver Foundry,	70	0
June 29th	Tap, Eagle Hotel,	84	0
Aug. 7th	Intake pump station,	1,800	60
Aug. 7th	Creek, 75′ above intake,	1,200	48
Aug. 7th	Tap, Roy Baker residence,	500	5
Aug. 7th	Tap, Oxford Hotel,	100	8
Aug. 7th	Tap, C. F. Lippincott residence,	48	0
Aug. 7th	Tap, Eagle Hotel,	300	0
Sept. 5th	Intake pump station,	350	18
Sept. 5th	Tap on pump,	5,400	0
Sept. 5th	Tap, Reems Shoe Factory,	60	0
Sept. 5th	Tap, Weaver residence,	140	0
Sept. 5th	Tap, Eagle Hotel,	40	6

It will be seen that Little Conewago Creek has a high bacterial content when at flood stage, that the filter crib does not remove the bacteria materially and that the treatment by copper sulphate during such periods is not satisfactory, although it reduces the danger.

Typhoid Fever.

The first report of the local Board of Health at New Oxford to the State Department of Health concerning the presence of typhoid fever within their borough was made in July, 1907. At that time a negative report was given. No typhoid fever was reported until December 1910 when 5 cases were reported. During 1911 twenty-eight cases were reported. In the following table is given the report of the local Board of Health to the State Department of Health:

Month.	1907	1908	1909	1910	1911
January,	—	—	—	—	0
February,	—	0	—	—	1
March,	—	0	—	—	5
April,	—	—	—	—	3
May,	—	—	—	—	2
June,	—	—	—	—	5
July,	0	—	—	—	1
August,	0	—	—	—	5
September,	—	—	—	—	4
October,	—	—	—	—	1
November,	—	—	—	0	1
December,	—	—	—	5	0
Total,	0	0	0	5	28

— No report.
0 Negative report.

The failure of the borough officials to report the presence of typhoid fever may have been due to a failure on the part of the physician to make reports to the Local Board or it may have been due to negligence on the part of the secretary of the local Board. After a new secretary was elected in 1910 reports to the Department of Health began to show the presence of typhoid fever. It was found during the investigation in 1911 that in 1910 there had been at least ten cases of typhoid fever with onsets in the following months: July three, August one, September one, November three and December one.

The investigation which is set forth in this report was begun in May and ended the latter part of June. A census was secured concerning 18 cases, 16 of which had been reported to the Department of Health by the local Board of Health. In the following table is shown date of onset of these 18 cases:

Day.	January.	February.	March.	April.	May.	June.
1,						
2,						
3,				1		
4,						
5,			1			
6,						
7,						
8,			1		1	
9,			1	1		
10,			1			
11,						
12,						
13,						
14,						
15,		1		1		
16,						2
17,						
18,						
19,					1	1
20,			1	1		
21,						
22,						
23,	1					
24,						
25,						
26,						
27,						
28,				1		
29,					1	
Total,	1	1	5	5	3	3

It will be noted that these cases were distributed over a period of nearly six months. One of the physicians in the borough made use of the Widal outfits furnished by the State Department of Health, and in six cases a positive Widal reaction was obtained.

In the following table is shown the age and sex of the 18 cases:

Age.	Male.	Female.
0- 4,	1	2
5- 9,	2	4
10-14,	1	0
15-19,	1	1
20-24,	0	0
25-29,	1	0
30-34,	0	2
35-39,	1	0
40-44,	1	1
	8	10

It will be noted that only three of the cases were over 35 years of age and 9 of the cases were under 10 years of age.

The water supply for three of the cases was secured from the public supply only. In one case a well and cistern furnished the only supply. In the remaining 14 cases the public water supply was used in connection with other supplies. No suspicion was directed to any particular well water, but each household had a well and also the public water supply. The public water supply was in almost universal use throughout the borough and a more extensive outbreak would have been expected had a severe infection occurred. Also the effect of a sudden infection would have shown on the chart setting forth the date of onset.

The milk supply for the borough was obtained almost wholly from two dairymen, they being the only dairymen who delivered milk from wagons about the borough.

Lewis Miller of Pleasant township, Adams County, delivered milk from a wagon throughout the borough. Milk was served from cans by use of a quart measure. He serves about 75 regular customers and had 6 irregular customers. He had 3 customers who obtained milk every other week from him. Every other week they obtained their milk supply from the Forry Dairy. Only 15 to 20 gallons were sold daily. Six to ten gallons of this amount was produced from his own dairy, 3 to 6 gallons from the dairy of Peter Fleschman and 3 to 6 gallons from Nicholas Ling. Occasionally a small amount was obtained from John Guselman. The last three dairymen named were located in Oxford township. All of these dairymen were visited and it was found that the premises were in a sanitary condition and milk was produced under conditions usually found about a small dairy that is carried on in connection with general farm work. The borough exercises no supervision over its source of milk supply and no restrictions were placed upon these dairies.

Mr. C. K. Forry, of Berwick township, sold milk from a wagon and he was also equipped with cans and a quart measure in making his delivery. He had about 100 regular customers, to whom were served about 23 gallons of milk daily. Fifteen to seventeen gallons of milk were produced on his farm. The remainder was obtained in about equal quantities from Mr. Calvin Cornister of Hamilton township and Mr. Gus Feiser of New Oxford borough. Mr. Feiser sold some milk from his own dairy direct to customers. The dairy of Mr. Forry and those from whom he secured milk were in a sanitary condition and satisfactory. There had been no typhoid fever among those producing milk for sale in the borough from these two dairies for at least one year.

The milk supply of the 18 typhoid fever patients was obtained as follows:

Lewis Miller,	11
Gus Feiser,	3
C. K. Forry,	1
Frank Spangler,	1
Spangler and Forry,	2

Five cases had eaten ice cream during the spring. The cream was purchased from the Taughinbaugh factory. The date of onset of those using ice cream was April 28th, May 18th, 2 on June 16th and 1 June 19th. The two cases on June 16th were those of Roy Taughinbaugh and his daughter Elizabeth. Mr. Taughinbaugh manufactured ice cream, the cream being obtained from the Hanover Creamery Company, which had a receiving station in New Oxford. At this station milk was received from the surrounding agricultural territory. The patrons of this station usually numbered about 28. On the farm of S. Hetrick, who was a patron of this milk station, a typhoid fever case occurred. The County Medical Inspector was in charge of the case. Milk had been delivered, however, to the receiving station at New Oxford during a part of the time typhoid fever was located upon the property. Mr. H. M. Stokes who is manager of the receiving station had not known of the typhoid on the dairy farm of Mr. Hetrick until May 17th and on that date Mr. Stokes refused to receive milk any longer from that source. The only product from this receiving station that was sold in New Oxford was butter that was received from the creamery at Hanover where all of the products of the station were sent except the cream that was sold to Mr. Taughinbaugh. The ice cream manufactured by Mr. Taughinbaugh was sold in New Oxford at a drug store and restaurant. It was also purchased for household use and by the hotels. It was also distributed through the townships for sale at socials and various gatherings. It can be concluded that ice cream from this factory had little or no effect upon the typhoid fever of the borough.

But one property on which typhoid fever was located was connected with the sanitary sewer system. One property had a cesspool. Good sanitary conditons existed on all of the properties. The principal part of the fever cases were in families financially able to properly care for the patients and provide the necessary sanitary precautions. The health officer of the local Board of Health inspected every property reported to him as containing a typhoid fever victim. All houses were placarded and disinfectants for use in the sick room were supplied free of charge by the local Board of Health.

Of the 18 typhoid fever cases visited there were probably 5 secondary cases. In the Weaver family where 4 cases occurred the dates of onset were March 5th, 10th and April 9th, 15th. The first two cases and last case showed positive Widal reaction. The case of April 9th was that of Mrs. Weaver who had previously acted as nurse for the cases of March 5th and 10th. It is possible that the last two cases in the Weaver family were of secondary origin.

In the Dunkel household where three cases occurred, one of them being Harry Keefer, the dates of onset were March 8th, 9th and April 20th, the last case being that of a daughter of Mrs. Dunkel. It is possible that the April case was due to secondary infection.

In the Bougher family the dates of onset were January 23rd and February 15th. Both of these cases gave positive Widal reaction and it is possible that the case of February 15th was of secondary origin.

In the Smith family the dates of onset were April 28th and May 18th. Here it is possible that the case of May 18th may have been secondary.

The two cases in the Taughinbaugh family, both having onsets on June 16th, may have had some connection to an infected milk supply from a township which is being investigated by the County Medical Inspector.

There was some typhoid fever in the townships surrounding New Oxford. In the following table is shown the typhoid fever in Berwick, Conewago, Hamilton, Mount Pleasant and Oxford townships by month for 1910 and 1911 together with the population of each township according to the census of 1910:

Month of Year.	Berwick Twp., population 568.		Conewago Twp., population 1,542.		Hamilton Twp., population 667.		Mount Pleasant Twp., population 1,804.		Oxford Twp., population 996.		Total by month.	
	1910	1911	1910	1911	1910	1911	1910	1911	1910	1911	1910	1911
January,	....	....	....	....	....	....	....	....	....	4	0	4
February,	....	....	....	....	....	....	....	....	....	2	0	2
March,	....	....	....	....	....	....	....	1	....	....	0	1
April,	1	....	....	....	....	....	....	....	....	3	1	3
May,	....	....	....	....	....	....	1	....	1	1	2	1
June,	....	....	....	2	1	1	....	....	....	3	1	6
July,	....	....	....	3	....	1	1	....	....	....	1	4
August,	....	1	1	....	3	....	....	2	2	....	6	3
September,	....	....	1	....	....	....	....	5	....	....	1	5
October,	....	....	....	....	....	2	1	....	....	....	1	2
November,	1	....	....	....	....	....	5	1	....	....	6	1
December,	....	....	....	....	....	....	....	....	1	....	1	0
Total, ...	2	1	2	5	4	4	8	9	4	13	20	32

It will be noted that in 1910 there were 20 cases in these five townships and in 1911, 32 cases. In both these years, and especially in 1911, the cases were well distributed throughout the year. When the population of New Oxford is considered in relation to the townships it will be noted that New Oxford borough has over five times the average amount of typhoid fever in these five townships. No investigation was made concerning the typhoid fever in these townships, but according to a statement of Dr. Sheetz there were in the Claybaugh family in New Oxford township four cases in 1910 and 5 cases in 1911. It is the opinion of the physician that there was but one primary case in this number, all the others being secondary cases.

Discussion.

The total number of typhoid fever cases throughout the year in New Oxford Borough was not large, but thirty cases in a population of 828 would give a rate of over 3,600 per 100,000. The physicians of the borough are of the opinion that a number of the cases were of secondary origin and that the water supply may have had some part in the infection. The public water supply was looked upon by them as of a very suspicious character. It was known that Little Conewago Creek was highly polluted and that during very low or high stages of the stream the water was delivered direct to the consumer without any purification whatever. Although a germicide was introduced at the pumping station by the borough still such treatment could not be relied upon as giving the desired protection as the water varied greatly in turbidity and fluctuated rapidly with precipitation.

Improvements Required by State Department of Health.

Prior to 1911 the Department had endeavored to obtain improvements in the water supplied to the public by the borough officials of New Oxford. The attention of the borough officials was again called to the condition of the public water supply and the necessity of improving its condition in a letter dated June 3rd, 1911, which reads as follows:

"June 3rd, 1911.

"To the Secretary of the
"Borough Council of
"New Oxford, Adams Co., Pa.

"Dear Sir:—

"Again at this time it is desired to call the attention of the borough authorities to the importance of furnishing to the public a pure and wholesome water for domestic use. You obtain your supply from the Conewago Creek. Sewage from Hanover and McSherrystown enters this stream and other sources of pollution exist. An outbreak of a water-borne disease such as typhoid fever in either of the above mentioned towns would almost certainly cause an outbreak of the same disease in New Oxford.

"The Department's representative has already assisted you in installing at your waterworks a temporary chemical treatment apparatus. The need for the installation during the present season, of permanent works cannot be too strongly emphasized. The only practical way to obtain a safe domestic water supply from the present source is by means of a modern filtration plant, and for such work a reputable waterworks engineer should be employed to work up a design. The plans should be submitted for the approval of this Department, which will then aid the borough in an advisory capacity. In the meantime, the present temporary dosing plant should be continued in operation until permanent works are provided for a safe water supply.

"Yours truly,
"SAMUEL G. DIXON."

No action was taken by the borough authorities upon the receipt of the communication date June 3rd, whereupon another communication was sent dated June 27th, which reads as follows:

"June 27, 1911.

"To the Secretary of Borough Council,
"New Oxford, Adams County, Pa.

"Dear Sir:—

"The Department of Health of the Commonwealth does not wish to appear to be unfair with the local authorities having by law charge of a water works system. The repeated delay on the part of the said authorities of New Oxford borough with respect to realizing the seriousness of the condition of the source of municipal water supply and the persistent delay in supplying effectual permanent remedies could not be tolerated were the system owned and operated by a private corporation. However, the responsibilities in the matter are not removed from the shoulders of the State Health Authorities because the New Oxford system happens to be a municipal plant, and it becomes my duty to speak very plainly to you and to say that unless you take prompt action to obviate any further unnecessary delay in planning for installing proper permanent apparatus for the purification of the water supplied through the municipal system to the public that I shall be compelled to take legal measures to put the members of council before the court in the same position that the owners of a private water company have to be put when they delay in carrying out the orders for the interests of the public health.

"Very truly yours,

"SAMUEL G. DIXON."

The borough council then retained Major D. F. A. Wheelock as a consulting engineer. It was decided to drill a test well to see whether or not a sufficient quantity of ground water could be secured. It was considered that ground water would be safer and cheaper. If sufficient quantities of ground water could not be secured from wells then the matter of filtration of the water from Little Conewago Creek would be considered.

The Department made an inspection of the borough as well as the watershed to improve sanitary conditions. The Department officers also inspected the condition of the sewage disposal and caused the construction and operation of the plant to be improved so as to secure a maximum efficiency under present construction.

30. TYPHOID FEVER AT PARKED.

An alarming number of typhoid fever cases were reported to the Commissioner of Health from Parker late in January, 1911. The County Medical Inspector visited the town and on his report of conditions the Commissioner of Health ordered the Chief Engineer to have a thorough investigation made of the water works and sewer system and to take such precautions as the Commissioner of Health might approve in aiding the County Medical Inspector to stamp out the epidemic. At that time there were twenty-four cases of typhoid fever reported. Up to February 16th, the number had increased to eighty-four with five deaths. Assistant Engineer Paul Hooker was assigned to the local work of co-operating with Dr. T. N. McKee, the County Medical Inspector. The following is Mr. Hooker's report of the operations of the Department. In this work he received instructions from the Chief Engineer and both were in constant communication with the Commissioner of Health during the progress of operations. Mr. Hooker was assisted by Inspectors Zeigler and Matthes of the Engineering Division.

Detailed Report of the Epidemic.

An unusual number of cases of typhoid fever were reported to the Department from Parker late in January and the County Medical Inspector for Armstrong County was at once ordered to visit the town and ascertain conditions. As a result three representatives of the Engineering Division were ordered to proceed at once to Parker and co-operate with the Medical Inspector and local officials in devising and executing the necessary measures to stamp out the epidemic. They arrived at Parker about noon on January 28th. Later the Commissioner received the following communication:

"Parkers Landing, Pa.,

"January 27, 1911.

"Samuel G. Dixon,
"Commissioner of Health,
"Harrisburg, Pa.

"Dear Sir:—

"At a meeting of the Council of the City of Parker, at which the Board of Health of the City was present, I was instructed to confer with you on the present condition of the City as relates to the health and sanitation. There are a number of Typhoid Fever cases (as you of course know). The Board of Health through their Secretary have notified Council that from data at hand they condemn the water supply and sewerage system, and ask Council to take immediate steps to correct the same. Dr. Phillips (Secretary of the Board) advises that Council ask that you furnish the City a copy of the Law, and instructions in this matter. Council has notified the Water Company to at once open and flush out all water lines having dead ends of which there are a number. Also have instructed their street commissioner to at once proceed to put the streets in a more sanitary condition, also notified all residents to take steps to generally clean up. The great drawback being that Council is crippled for the want of funds, and if it should mean a sewerage system, the city is unable to even begin.

Any advice in the matter and a plan for prompt results will be gladly acted on. I will also add that the Mayor is confined to his bed sick.

By direction of Council,

J. A. FOSTER, Clerk."

At that time there were twenty-four reported cases of typhoid fever and up to February 16th the number had increased to eighty-four, five of whom died. Conferences were held between the State officials and the local Board of Health, City Council and other officials and active steps taken to prevent further spread of the contagion. The work already started by the local authorities was given an impetus and additional steps taken. Under the supervision of the Department precautions were taken against further infection of the water supply by temporary provision for the continuous treatment of the water with a germicide. The necessity for boiling all water for domestic purposes was insisted upon. The milk supply was investigated and safe-guarded. The sewage and garbage disposal questions were considered and active steps taken in the matter of cleaning up the town generally. There were but four physicians practising in the city and these were required to report new cases without delay to the Department's representatives and the history and surroundings of these cases were at once investigated. The city employed a visiting nurse who rendered excellent service working under the direction of the State representatives in reducing secondary infection.

From the facts as given in the following pages it will be observed that there were but few cases whose time of infection was later than February 1st and many of these were of secondary origin indicating that the infection to which the epidemic was due was effectually checked by that time.

In the succeeding pages are given a general description of the City of Parker with special relation to sanitary and other features having a bearing upon the epidemic, together with a history of the epidemic, the probable cause, and the steps taken to eliminate the infection.

General Conditions.

The City of Parker is near the extreme northwestern part of Armstrong County, on the west bank of the Allegheny river about 85 miles above Pittsburg. The municipal territory extends from the river west to the county line a distance of about one mile with a frontage along the river of about a mile and a half.

Its present population is 1,244. In 1900 it was 1,070, in 1890 it was 1,317; in 1880 it was 1,835, and in 1870 it was 7,000. On March 1st, 1873 when the city charter was granted, the town had possibly 20,000 inhabitants drawn thither by the development of a rich oil pocket in the immediate vicinity. As the oil became exhausted the population rapily diminished.

The industrial and business portion of the city occupies a stretch of low lands bordering the western bank of the river with an average elevation of about 20 feet above low water mark. This stretch of land varies from 150 to 300 feet in width in the northern part of the city, while in the southern part it becomes narrower, in some places not exceeding 50 feet. Immediately west of this flat land is a precipitous bluff extending up to the main residential portion of the city which is elevated from 110 feet to 150 feet above the flat lands and extends on a gradual slope back from the edge of the bluff. Here about 75 per cent. of the population reside. The higher portion of the town is divided into three parts by small streams which pass through precipitous gorges cutting through the bluff. There are two such streams, Church Run and Mike's Run, passing through the city both flowing from the west and discharging into the Allegheny river. Another stream, Bear Creek, heads in the northwestern part of Butler County and flows in a northeasterly direction, passing immediately south and nearly parallel with the southern boundary line and entering the Allegheny river a short distance below the southeastern corner of the city. This stream also flows through a deep, narrow gorge with steep slopes on either side.

The Pittsburgh and Western branch of the Baltimore and Ohio Railroad between Pittsburg and Kane extends north through the city along the foot of the bluff. On the opposite side of the river is the Buffalo and Allegheny Valley Division of the Pennsylvania Railroad, being the main line from Pittsburg to Buffalo. A highway bridge crosses the river at this point.

There are a few manufacturing plants the chief one being the Wightman Glass Company, manufacturing bottles and employing about 125 persons. Beside this there are about 50 men employed around Bear creek oil pumping station of the National Transit Company while a specialty works, flour mill, a chemical works and a machine shop, give employment to about 20 hands in all. There appears to be no probability of any marked increase along industrial lines.

Nearly all the dwellings in the city are of wooden construction with ample yard space. Many of the sidewalks but none of the streets are paved. There is but one school house, a substantial brick structure in the higher or residential district.

Water Supply.

Parker is generally supplied with water by the Parker City Water Company. The works were built in 1872 but it was not until January 16th, 1891, that incorporation was effected. The Allegheny river water is partially clarified by passing through a crib in the bed of the river and a small so called filter and then pumped to three wooden tank distributing reservoirs, two of which serve the distribution systems in the high districts and one the low lying section along the river. A fourth old tank has been recently abandoned.

The intake consists of a wooden crib 18 feet long, 8 feet wide and 4 feet deep filled with stone, gravel and sand laid in the bed of the river about 230 feet from the bank and below low water level. Two 4 inch lines extend from this crib to a well about 12 feet square in plan and 8 feet deep with an arched roof and covered manhole. The well is located on the shore at a point above low water mark, in excavation and covered with earth. The bottom is sufficiently low to permit the two 4 inch pipes from the crib to discharge by gravity into the well at a point about 4 feet above the floor. It is possible that there may be some leakage of river water into this well, especially at times of high water when it is submerged. A 4 inch suction line extends from the well to the pumping station about 25 feet distant on the bank of the river.

The pump station is located at the lower end of the narrow strip of ground known as the "flats" described above. The installation comprises a low lift and a high lift pump, and a screening apparatus locally known as a "filter." Both pumps are belt driven by one 20 horse power simplex gas engine. The low lift pump is a Cameron 6 inch by 12 inch pump located in a pit in the pumping station about 10 feet below the floor level and delivers water from the well to the "filter."

A crude attempt at mechanical filtration has been in use since 1905, so it is reported. A horizontal boiler shell 4 feet in diameter and about 12 feet long filled to a depth of about 30 inches with sand taken from the river is located in a room adjoining the pump room. Water is delivered above the surface of the sand through a 4 inch pipe and flows out from the bottom by gravity to a 42 inch steel tank 10 feet high in the pump pit whence it is drawn by the high lift pump. No coagulant is used. An arrangement of valves and pipes permits back washing under pressure from the pump and force main. During the Department's recent investigation, lasting several days there was always a marked turbidity in the effluent. The river was then at a moderate stage and highly turbid and the "filter" required washing every two to four hours.

The high lift pump is a Deming triplex 7 inch by 8 inch geared pump, belt driven by a gas engine and has a reported capacity of about 200,000 gallons a day. From the 4 inch force main extending to Numbers 2 and 3 distributing tanks serving the high ground, there is a 3 inch branch connection near the pump through which water is forced to the distributing tank Number 1, serving the low ground, the discharge through the 3 inch main being throttled by a valve at the pump station.

The tanks are all of wooden construction. Number 3 tank was recently erected to replace a smaller one which had worn out. Number 4 tank is in a dilapidated condition and on February 2nd, during the outbreak of Typhoid Fever was placed out of commission, leaving only three tanks in service. Number 1 tank is about 400 feet distant from the pump station and has a capacity approximating 24,000 gallons; Number 2 tank, about 1,500 feet distant, has a capacity of about 27,000 gallons; Number 3 tank, about 4,000 feet distant, holds about 40,000 gallons. The inlets to tanks Nos. 1 and 2 are at the top, and to tank No. 3 at the bottom. All three tanks have tight board covers, that on No. 2 having been placed about February 4, 1911. All the water supplied to the consumers passes through one or other of the tanks whence it is distributed by gravity to the several districts, through about 15,000 feet of 2 inch, 3 inch and 4 inch mains.

Tank No. 1 supplies the lower district along the flats where the few industries are located. It is about 125 feet higher than the general ground level of this section but the full pumping head of about 285 feet is available for fire protection.

Tank Number 2 serves the district on the bluff north of Church Run. It is about 208 feet above the pump and the average available head, under normal conditions is about 100 feet. By way of a valved connection about 175 feet head is available for fire protection.

Tank Number 3 supplies the high district south of Church Run and north of Mike's Run, the available head averaging about 140 feet. There is no means of by-passing the tank, hence all water must pass through it.

Originally the water mains were partly of wooden construction and partly of iron, but of recent years the wooden pipes and a portion of the old iron pipes have been replaced with cast iron. Some of the old iron pipes are in very bad condition through the action of rust and the accumulation of sediment, there being no adequate means of blowing out the system. The end of nearly every branch is virtually dead. In most cases house taps are placed on the extreme ends of the pipes and in some cases there are fire plugs near the ends.

There are at least a dozen wells in use in the higher portions of the town, in some cases used by several families. There are also several springs used wholly, or in part, by a number of inhabitants. The probable number of consumers depending upon the Parker City Water Company's supply is about 1,000 or 80 per cent. of the population. Most of the remaining persons use the public water, at least occasionaly. No records have been kept by the water company of the amount of water which has been pumped but it is estimated to average about 80,000 gallons a day, or about 80 gallons per capita.

The Department has made analyses of samples of the river and tap water at Parker at various times, the results of which are given in the following table. The temporary germicidal treatment of the water was instituted on January 29th, 1911.

Date.	Location.	Total bacteria per c. c.	
		Bacteria.	B. Coli.
	Samples Taken Before January 29, 1911.		
Dec. 28, 1909.	Tap—B. & O. R. R. Office,	450	0
April 22, 1910.	Tap—Wayne Avenue,	9,000	0
April 22, 1910.	Tap—Cooper Avenue,	28,000	16
May 26, 1910.	Tap—Central Hotel,	38	2
May 26, 1910.	Tap—Bluff Avenue,	16	0
Jan. 28, 1911.	Tap—Central Avenue,	720	0
Jan. 28, 1911.	Tap—Globe Hotel,	80	0
Jan. 28, 1911.	Tap—Mansion House,	180	0
Jan. 28, 1911.	Tap—Central Hotel,	500	0
Jan. 28, 1911.	Tap—Lincoln Avenue,	400	0
Jan. 28, 1911.	Tap—Euclid Avenue,	16	0
Jan. 28, 1911.	Tap—Ludlow Avenue,	40	0
Jan. 28, 1911.	Tap—Washington Avenue,	120	0
Jan. 28, 1911.	Tank No. 1,	300	0
Jan. 28, 1911.	Tank No. 2,	360	0
Jan. 28, 1911.	Tank No. 3,	80	0
Jan. 28, 1911.	Tank No. 4,	210	0
Jan. 28, 1911.	Raw water, river at pump station,	1,500	8
Jan. 28, 1911.	Raw water, inlet "filter,"	2,000	16
Jan. 28, 1911.	"Filtered" water at pump station,	2,400	10
	Samples Taken After January 29, 1911.		
Jan. 30, 1911.	Tap—Washington Avenue,	100	4
Jan. 30, 1911.	Tap—Cooper Avenue,	350	12
Jan. 31, 1911.	Tap—Washington Avenue,	36	0
Jan. 31, 1911.	Tap—Cooper Avenue,	140	0
Jan. 31, 1911.	Tap—Ludlow Avenue,	30	0
Jan. 31, 1911.	Tap—Lincoln Avenue,	90	0
Feb. 1, 1911.	Tap—Bluff Avenue,	40	0
Feb. 1, 1911.	Tap—Bluff Avenue,	32	0
Feb. 1, 1911.	Tap—Washington Avenue,	48	1
Feb. 1, 1911.	Tap—Hotel Parker,	60	0
Feb. 2, 1911.	Tap—Hotel Parker,	30	0
Feb. 6, 1911.	Tap—Mansion House,	4	0
Feb. 7, 1911.	Tap—Globe Hotel,	10	0
Feb. 9, 1911.	Tap—Washington Avenue,	50	3
Feb. 9, 1911.	Tap—Central Hotel,	40	3
Feb. 13, 1911.	Tap—Lincoln Ave.,	24	0
Feb. 13, 1911.	Tap—Washington Ave.,	12	0
Feb. 13, 1911.	Tap—Globe Hotel,	280	0
Feb. 16, 1911.	Tap—Globe Hotel,	60	0
Jan. 31, 1911.	Raw water, river at pump station,	480	8
Feb. 1, 1911.	Raw water, river at pump station,	1,200	18
Feb. 2, 1911.	Raw water, river at pump station,	320	24
Feb. 6, 1911.	Raw water, river at pump station,	26	?
Feb. 7, 1911.	Raw water, river at pump station,	70	?
Feb. 9, 1911.	Raw water, river at pump station,	210	8
Feb. 13, 1911.	Raw water, river at pump station,	210	4
Jan. 31, 1911.	"Filtered" at pumping station,	140	8
Feb. 1, 1911.	"Filtered" at pumping station,	350	8
Feb. 6, 1911.	"Filtered" at pumping station,	98	?
Feb. 7, 1911.	"Filtered" at pumping station,	80	?
Feb. 9, 1911.	"Filtered" at pumping station,	170	6
Feb. 13, 1911.	"Filtered" at pumping station,	60	6
Feb. 16, 1911.	"Filtered" at pumping station,	600	5
Jan. 31, 1911.	Treated water at pumping station,	112	0
Feb. 1, 1911.	Treated water at pumping station,	20	0
Feb. 2, 1911.	Treated water at pumping station,	16	0
Feb. 6, 1911.	Treated water at pumping station,	6	0
Feb. 7, 1911.	Treated water at pumping station,	24	0
Feb. 9, 1911.	Treated water at pumping station,	70	1
Feb. 13, 1911.	Treated water at pumping station,	40	1
Feb. 16, 1911.	Treated water at pumping station,	32	0

There is a retaining wall several hundred feet long along the eastern side of River Avenue opposite the business portion of the city. A narrow strip of land between this wall and the river slopes downward rapidly forming the river bank and containing 28 sewer outlets, both public and private from this portion of the city. It is also used extensively as a dumping ground for garbage and refuse. Some years ago a one-fourth owner of the Water Company purchased the land lying east of River Avenue, and extending from Bridge Street about 800 feet south to the water works pumping plant. He thus obtained control of the land on which the sewer outlets discharge, and did so nominally with a view to protecting the water supply. Nothing was done, however, to reduce these pollutions but on the contrary in at least one instance, namely April 23rd, 1909, the owner gave the privilege to a property owner to increase the amount of sewage so discharged by the construction of a new private sewer with outlet to the river.

Numerous wells and springs in various parts of the city are used largely by their owners and to some extent by neighbors. There is also a small private system owned by J. S. Brady serving a few houses.

The private system of J. S. Brady comprises a spring and 2 inch gravity line supplying several tenant houses belonging to Mr. Brady. The spring is situated near the top of the bluff in the northern part of the city, and is uncovered and readily accessible to passers-by. The surroundings are such that indirect pollution through underground sources also seems easily possible as there are residences within about 200 feet and at a considerable higher elevation. This spring was formerly used as an auxiliary supply by the Parker City Water Company and was connected with the main at Central Avenue but, becoming alarmed by the presence of typhoid in houses above it, the water company several years ago severed the connection and abandoned the spring.

Samples from various wells and springs had been tested by the Department previous to the present investigation and in some cases pollution was found and the owners had been notified. As part of the epidemic work other samples were taken from some of these sources and many others as shown in the table below, but in only one of the recent samples was the presence of sewage organisms detected. The local Board of Health and the owner of this well were promptly notified.

Analyses of Private Water Supplies.

Date.	Name.	Bacteria per c. c.	
		Total.	B. Coli.
Jan. 28, 1911.	Spring, Brady,	250	0
Jan. 28, 1911.	Tap on spring supply,	10	0
April 22, 1910.	Spring, David Mourer,	10,000	1
Jan. 28, 1911.	Spring, David Mourer,	36	0
Jan. 31, 1911.	Spring, David Mourer,	50	0
April 22, 1910.	Spring, Elliott, foot Washington Avenue,	3,000	5
Jan. 31, 1911.	Spring, Elliott, foot Washington Avenue,	40	0
May 26, 1910.	Well, Ida Parker,	20	0
Feb. 1, 1911.	Well, Ida Parker,	70	0
April 22, 1910.	Well, W. H. DeLancey,	4,300	13
May 26, 1910.	Spring, S. H. McNaughton,	6	0
May 26, 1910.	Well, Sheidemantle,	11,000	10
May 26, 1910.	Well, W. B. Ramsey,	3	0
Jan. 28, 1911.	Spring, Glass Works,	20	0
Jan. 30, 1911.	Spring, Ferntown No. 1,	16	0
Jan. 30, 1911.	Spring, Ferntown No. 2,	60	0
Jan. 30, 1911.	Spring, Grazier,	40	0
Feb. 1, 1911.	Spring, Karns Specialty Co.,	24	0
Feb. 1, 1911.	Spring, John Taylor,	60	0
Feb. 1, 1911.	Well, C. S. Overheim,	50	0
Feb. 1, 1911.	Spring, Spier,	20	0
Feb. 6, 1911.	Spring, Billy Bowser,	8	0
Feb. 7, 1911,	Spring, Dee Farm,	2	0
Feb. 9, 1911.	Well, Edward Walters,	80	8
Feb. 6, 1911.	Well, John Ramsey,	2	0

Sewerage.

The city of Parker has no public sanitary sewers, but there are twelve short public storm drains so called, all but possibly two of which receive more or less sewage. There are upwards of 120 private sewers serving more than 180 properties. These sewers discharge either directly to the river, to small runs, over the edge of the bluff, or, in a dozen or more cases, into the public storm drains. During the investigation a house to house canvass of all the properties on the flats was made by Department representatives from which it was ascertained that in this section there are 60 properties, 52 of which have sewer connections leading to the river above the water works intake. These discharge by way of 27 private outlets 6 inches to 12 inches in diameter, and 5 public storm drain outlets 12 inches to 24 inches in diameter. All but possibly one of the public sewer outlets in this district have house connections for domestic sewage. Out of a population in this section of over 350 persons more than 90 per cent. contribute sewage by way of these outlets. These figures include the employees, 125 in number, of the Wightman Glass Works. The sewer outlets are all within a few feet of the east side of River Avenue, the main business thoroughfare.

No detailed canvass of the properties in the higher districts was made at this time but the figures given below are taken from results of a sanitary survey of the town made by the Department in 1907. There has been a material increase in the number of sewered properties since that time but exactly to what extent is not known.

Private Sewers in the High Districts.

Point of Discharge.	Number of sewers.	Properties connected.	Population served.
To Bluff direct,	38	38	116
To Bluff via highways,	4	4	26
To Bluff via waterways,	3	3	11
To Bluff vi astorm sewers,	10	10	39
To highways,	18	18	45
To Church Run,	20	22	88
To Mike's Run,	1	1	4
Total,	94	96	329

Thus it is seen that, of the total population of 1,244, nearly 700 persons have sewer connections and nearly one-half this number contribute sewage to the river at points above the water works intake. The remaining population depend upon privies and in three instances old wells used as cesspools.

A great many of the private sewers are laid across public streets but in no case do they follow the streets and probably none of them could be adapted to use as parts of a public sewerage system. They could, however, be largely intercepted by sanitary sewers in the streets. A large number of the sewers discharging over the bluff are located directly above the settled portion of the flats. The amount of sewage in each instance is comparatively small and is generally lost to view in the mass of detritus at the base of the cliff. Backed up against the foot of this slope there are a number of occupied houses and other buildings and the discharge of sewage on the bank above must inevitably be a menace to residents below, especially in wet weather. This has been the cause of numerous complaints to the local authorities.

At the top of the hill leading to Washington Avenue and close beside the highway at the top of the bluff there are several public storm drains and private sewers discharging sewage on to the slope. This produces extremely offensive conditions and is the source of numerous local complaints. This road is the principal one of the two thoroughfares leading from the business portion of the town to the residential section.

A large portion of the low section of the city is built over what was formerly a swampy area, afterward filled in, and many of the privies in this section are subject to overflow during wet weather. As little attention is given to cleaning them out, this condition has in many cases caused local nuisances. At the time of the investigation there were 12 privies on the "flats" full to overflowing beside others in the high districts.

Garbage Disposal.

There has never, up to this time, been any systematic collection of garbage in Parker. The common practice has been for each householder to dispose of his garbage to suit his own convenience and usually with utter disregard of the health or comfort of his fellow citizens. The river front has been used as a dumping ground very generally by residents and store keepers on the flats naturally resulting in an accumulation of rat-infested filth, offensive to the senses and a menace to health. These deposits remain until a rise in the river wash all or part down stream, some of it being carried to or over the water works intake. Many other residents in both the low and high districts dump garbage indiscriminately into the streets and alleys or allow it to accumulate in their own yards. The residents along the bluff in many cases throw their garbage over the steep bank to fall or wash down upon occupied premises below. The city ordinances, notably one passed by Council June 11th, 1899, and one approved July 9th, 1908, provide ample means to entirely stop such abuses, but the city officials have failed to perform their duties and the citizens have been indifferent.

Milk Supply.

The milk supply to the inhabitants of Parker is derived mainly through two dealers both of whom produce all the milk they handle. One of these, Robert H. Pollock, Jr., supplies milk from his farm in Perry Township, Clarion County, across the river from Parker, to 123 customers. The other, S. E. Pryor, produces milk within the city limits and supplies about 30 customers. These two dealers therefore supply more than one-half the population, the remainder depending upon their own cows or those of neighbors, none of whom supply more than three or four families.

Typhoid Fever in Parker.

The Department is informed that there was a typhoid fever epidemic in Parker between October 1906 and January 1907, during which time there were about 40 cases, and that this followed about three weeks after a similar epidemic at Foxburg which is about 5 miles above the city on the Allegheny River. It is possible that the epidemic at Parker at that time may have been due to contamination of its water supply by the typhoid cases at Foxburg. It is also reported that prior to October 1906, there had been very few cases and that from January 1907, to August 1908, the city was practically free from typhoid fever. After that time there were a number of cases, a few of which were imported. In March, 1910, there were three cases and in June two cases. None of those up to December, 1910, have been reported to the State Department of Health as required by law, the above information having been obtained locally. The cases which occurred after November 15th, 1910, are given in the table following which covers the present epidemic.

Typhoid Fever Epidemic of January, 1911.

The following table shows the cases of typhoid fever due to infection received at Parker from November 15th, 1910, to February 16th, 1911:

Date of Onset.	Number of Cases.														
	By Age Groups.											Sex.		Secondary.	Total.
	0—4	5—9	10—14	15—19	20—24	25—29	30—34	35—39	40—44	45—49	50—over	M.	F.		
1910.															
Nov. 15, ...	....	2	....	....	....	....	....	....	....	....	....	1	1	....	2
Nov. 21, ...	....	....	....	....	1	....	....	....	....	....	....	1	....	....	1
Nov. 25, ...	....	....	....	....	....	....	1	....	....	....	....	1	....	....	1
Dec. 1, ...	....	1	....	1	....	....	1	....	....	....	....	2	1	....	3
Dec. 14, ...	....	....	....	1	....	....	....	....	....	....	....	....	1	....	1
Dec. 24, ...	....	....	....	....	1	....	....	1	....	....	....	1	1	....	2
Dec. 25, ...	....	....	....	....	....	1	....	....	....	....	....	....	1	....	1
Dec. 26, ...	....	....	....	....	1	....	....	....	....	....	....	1	....	....	1
1911.															
Jan. 4, ...	....	....	....	1	....	....	....	....	....	....	....	1	....	....	1
Jan. 8, ...	....	....	....	....	....	1	....	....	....	....	....	1	....	....	1
Jan. 10, ...	....	....	....	....	1	....	....	....	....	....	....	1	....	....	1
Jan. 11, ...	....	1	....	....	1	....	....	....	....	....	....	2	....	....	2
Jan. 12, ...	....	....	....	1	....	....	....	....	....	1	....	....	2	....	2
Jan. 13, ...	....	....	....	....	1	....	....	....	....	....	....	1	....	....	1
Jan. 14, ...	....	....	1	....	....	....	1	....	....	....	....	1	1	....	2
Jan. 15, ...	1	1	....	1	1	1	....	....	....	....	....	3	2	....	5
Jan. 18, ...	....	....	1	....	....	1	....	....	....	....	....	1	1	....	2
Jan. 19, ...	....	2	2	....	....	1	....	....	....	....	....	4	1	....	5
Jan. 20, ...	....	....	1	2	2	1	....	....	....	....	....	4	2	....	6
Jan. 21, ...	....	1	1	2	1	1	1	....	....	1	....	4	4	....	8
Jan. 23, ...	....	....	....	1	1	....	1	....	....	....	....	2	1	1	3
Jan. 24, ...	....	....	1	1	....	....	....	....	....	....	....	1	1	....	2
Jan. 25, ...	....	1	....	....	1	....	....	....	....	....	....	1	1	1	2
Jan. 26, ...	....	....	1	1	....	1	....	....	....	....	....	1	2	1	3
Jan. 27, ...	1	2	3	....	....	....	....	....	....	1	....	2	5	2	7
Jan. 28, ...	....	1	1	1	....	....	1	....	....	....	....	3	1	1	4
Jan. 29, ...	....	....	1	1	....	....	....	....	....	....	....	2	....	2	2
Jan. 30, ...	....	1	....	....	....	....	....	....	....	....	....	....	1	....	1
Feb. 1, ...	....	1	....	....	....	....	1	....	1	....	....	2	1	1	3
Feb. 3, ...	....	....	....	....	....	....	....	....	1	....	....	1	....	1	1
Feb. 5, ...	....	....	3	....	....	....	....	....	....	....	....	2	1	....	3
Feb. 6, ...	....	....	1	....	....	....	....	....	....	....	....	....	1	1	1
Feb. 7, ...	....	....	1	....	....	....	....	....	....	....	....	....	1	1	1
Feb. 16, ...	1	2	....	....	....	....	....	....	....	....	....	1	2	3	3
Total, ...	3	16	18	14	12	8	7	1	2	3	0	48	36	15	84

Each of these cases was visited and the history obtained by representatives of the Department. A detailed study was made indicating that out of a total of 84 cases 15 of the later ones were clearly due to secondary infection directly from previous cases, generally in the same household. In 5 other cases and probably several more the evidence indicates possible secondary origin but not conclusively.

Between November 21st and January 23rd, 6 cases* of fever occurred among the men employed at the Bear Creek pumping station of the National Transit Company in the southern part of the city and in the construction of large oil tanks nearby. Accordingly the locality was inspected on January 30th. The pumping station is located on low ground near the river at the mouth of Bear Creek and the tanks where the construction work is in progress are on the bluff above. Many of the employees are residents of Parker while a few live in tents near the works. Only the last one of the 6 cases among the men occurred among the tent dwellers. This man lived alone in a tent separated from the others by several hundred feet and was taken ill on January 23rd. He had frequently visited the city during the evenings and partaken of the public water. The patient had been removed to Butler on January 28th and his tent at the time of inspection remained as he left it and unoccupied. Instructions were given to the Superintendent to sterilize the tent either by boiling or exposure to live steam and to burn or sterilize the bedding and utensils, to disinfect and bury all garbage and excreta and sprinkle lime freely throughout the whole vicinity. Orders were given that no other tents should be erected on the spot, that the entire camp and vicinity be thoroughly policed, excreta disinfected and buried wherever found, suitable privies erected for the use of the men and their use enforced. It was ascertained that the Superintendent had already given orders, which were being executed, that the water served to the men during working hours be boiled and apparatus for the work had been installed. The springs and wells from which water was taken for use of the men in camp were inspected and samples taken for analysis. No pollution was found. The investigation resulted in a vast improvement of sanitary conditions but there appears to be no reason to believe any of the cases received their infection in this locality but rather that they all originated in the settled portion of the city.

Between November 15th and December 31st, 1910, there were 12 cases occurring at irregular and of these four were located on the flats and connected with sewers discharging into the river above the water works intake. The other 8 cases were scattered throughout the town on the high ground. Three of these four cases occurred in November and were connected with a sewer outlet discharging about 400 feet above the pumping station but in a position such that the sewage would probably not pass close to the intake. The date of onset of the fourth case mentioned was December 26th and sewage from the property was discharged on the river bank about 900 feet above the intake. The current of the river is here slightly deflected so that sewage from this point passes almost directly over the intake crib. There occurred a rise in the river from 2.5 feet on December 28th to 12.6 feet on January 3rd after which the water gradually receded to the 3.5 foot stage on January 10th then rose to 14.7 feet on January 15th and then rapidly fell to 2.8 feet on January 27th. The first rise must inevitably have carried typhoid laden sewage from the river bank to or near the waterworks intake and may readily have caused a violent infection of the water supplied to the public at that time. From the 8th of January to the 21st there occurred 35 cases all of which may have been caused by such an infection. One of these cases visited Parker on the 1st and 3rd of January only and drank of the public water on those dates.

It is possible that the three November cases above mentioned may have infected the public water supply but it seems more probable that the earlier infection came from elsewhere. Observation of the table given below showing cases of typhoid fever which have occurred on the Allegheny river and its tributaries above Parker during 1910 points clearly to highly probable infection of the public water supply at Parker. This may have been the cause of the earlier scattered cases and possibly of the entire epidemic.

Typhoid Fever Above Parker.

Cases reported in 1910 from cities and boroughs but not including rural districts or New York State. First column gives approximate distance in miles above Parker.

Miles.	Place.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
7	Emlenton,	....	1	1	5	5	....	....	....	2	....	3	....
19	Edenburg,	....	....	....	....	....	....	....	....	....	1	....	2
23	Clarion,	....	....	....	....	....	....	....	....	....	....	1	1
33	Polk,	1	....	1	1	1	....	....	....	1	....	....	1
41	Franklin,	1	....	....	....	1	4	1	7	7	....	1	....
49	Oil City,	....	....	....	....	....	....	....	....	....	....	5	....
56	Cochranton,	1	....	....	....	1	....	....	3	....	....	....	....
65	Titusville,	....	6	2	....	....	....	1	4	17	2	3	1
68	Geneva,	....	....	....	....	....	2	....	....	1	....	....	....
69	Meadville,	....	....	....	1	....	....	1	....	....	....	....	2
70	Pleasantville,	....	....	....	....	....	....	....	....	1	....	....	....
70	Ridgway,	....	2	....	1	....	....	....	2	7	12	....	1
77	Johnsonburg,	....	....	....	....	1	....	....	1	1	....	1	....
78	St. Marys,	....	1	....	....	....	....	....	14	2	....	....	2
78	Mill Village,	....	....	....	....	....	....	....	1	....	....	....	....
84	Tidioute,	....	....	....	....	....	....	1	1	....	....	....	....
88	Union City,	1	....	....	....	....	....	....	1	....	1	1	....
102	Youngsville,	6	....	1	....	1	....	....	....	1	....	....	....
107	Warren,	....	....	1	....	1	....	2	8	12	7	1	....
122	Corry,	....	....	....	....	1	....	....	....	....	....	....	....
136	Kane,	....	....	....	1	....	1	....	1	3	7	....	....
165	Bradford,	....	1	....	....	....	....	1	1	2	9	....	....
182	Eldred,	....	....	....	....	....	....	1	5	4	1	....	....
183	Shinglehouse,	....	....	....	....	....	....	....	....	....	....	3	....
196	Coudersport,	....	....	....	....	....	....	....	1	1	....	....	....
	Total,	10	11	6	9	12	7	8	50	62	40	19	10

During the last five months of the year 1910 there occurred 143 cases, as shown by the foregoing table, in towns along the river or its tributaries no further distant upstream than Warren, which is 107 miles above Parker. The total number of cases above Parker, including Coudersport, 196 miles upstream, shows 181 cases during the last five months of the year.

There are upward of 500,000 persons resident on the drainage area of the Allegheny river above Parker. About one-half of these are in the rural districts not included in the above tabulation and an increase of 50 per cent. of the total figures given would about represent the number of typhoid fever cases on the entire area. This would give about 240 cases during the last five months of the year 1910. Even assuming complete disinfection of the excreta during the progress of the disease in each case, the universal practice of discontinuing such precautions during convalescence must have resulted in the presence at times of typhoid infection in the water served to the public at Parker.

MEASURES TAKEN TO STAMP OUT THE EPIDEMIC.

Water Supply.

The local Board of Health had long been suspicious of the character of the public water supply and were instrumental in having published in every issue of the local weekly paper beginning with December 1st, 1910, the following notice: "We are advised by the physicians of town to notify all our subscribers to boil all their water. There is considerable typhoid fever in town and it is thought advisable to take all necesary precautions."

The attention of the School Board had been early directed to the danger attendant upon allowing the pupils at the only school building in the city to drink raw public water. No action had been taken by them and so on January 26th the City Council addressed the following communication to the School Board:

"Parkers Landing, Pa.,
January 26, 1911.

"Parker City School Board.

"Gentlemen:—

"At a meeting of the Council of Parker City of this date, at which meeting the Board of Health of the City was present, a motion was adopted That, The Board of School Directors allow no water to be used at the School Building that has not been boiled. And that the Board furnish and place in use proper appliances to comply with this request. And a copy of this motion be placed in the hands of the School Board.

(Signed) "J. A. FOSTER,
"Clerk of Council."

On the same date the City Council addressed the following letter to the Parker City Water Company.

"Parkers Landing, Pa.,
"Jan. 26th, 1911.

"The Parker City Water Company,

"Gentlemen:—

"At a meeting of the Parker City Council of this date, at which meeting the Board of Health of the City was present, the following motion was duly made, seconded and passed:

"That the Parker City Water Company be required to at once proceed to open and flush out all dead end water lines, using such solution as may be recommended by the Secretary of the Board of Health, in order to more easily cleanse the lines and tanks. And that the Fire and Water Committee are hereby ordered to see that the above requirements are complied with, in doing which they are instructed to secure proper persons to attend the work who shall be paid for their services. And that a copy of this action be placed in the hands of the Parker City Water Company, who shall furnish the Committee in charge a map showing all water lines owned by them in the city.

(Signed) "J. A. FOSTER,
"Clerk of Council."

A man was accordingly employed to act as inspector to see that the orders of Council with respect to the water supply were executed. Nothing had been done toward the accomplishment of this work up to January 28th.

The representatives of the Engineering Division of the Department of Health immediately upon their arrival at noon on January 28th, 1911, ordered the water company to immediately blow out the mains of the distributing system, to disinfect the water in the reservoirs and to install temporary apparatus for the treatment of the water with a germicide. A force of a dozen or more laborers and pipe fitters was put to work late in the afternoon and continued on duty during the night and following day, locating and uncovering the dead ends and making the necessary connections for blowing them out under pressure. The work was seriously hampered by the inaccuracy of the existing plans of the system and the fact that the exact location of all but few of the dead ends could be ascertained only by exploratory excavation. While this work was in progress all the fire hydrants in the city were opened and so far as possible the mains were thus flushed out. After continuous disinfection had been installed the system was again blown out and all taps in the city opened for 15 minutes, upon verbal instruction of the local inspector who visited the houses for this purpose. The work of locating and blowing out dead ends was persistently kept up but not completed until February 1st.

During the night of January 28th representatives of the Department treated the water in tanks Nos. 1, 2 and 3 with a solution of copper sulphate in the proportion of one part in a million.

At about midnight of the 28th the installation of the apparatus for treatment of the water at the pumping station was completed and, upon the arrival of the chemicals previously ordered from Kittanning, the dosing of the water was started two hours later. The apparatus consisted of two barrels, one for mixing the solution and the other for regulating the rate. Chloride of lime was used in the proportion of 0.57 parts in a million, available chlorine, and this treatment has been continued without interruption since that time.

It was ascertained that the three tanks mentioned had been carefully cleaned within two weeks and it was deemed unnecessary to have this done over again, especially in view of the chance of accident to the antiquated pumping appliances and the consequent danger of leaving the city without water. Tank No. 4 had not been cleaned but it was cut off and held in reserve for fire protection and later dosed with copper sulphate. Upon inspection this tank was found to be in bad decay, and on February 5th the Water Company decided to abandon its use permanently.

The Water Company was directed to have prepared at once an accurate plan of the water works system and to file a copy with the Commissioner of Health and also to forthwith engage a competent engineer to prepare plans for improvements of the water works system which should ensure a safe supply to the citizens of Parker at the earliest practicable date and to submit such plans to the Department with application for their approval. Instructions were given that the temporary treatment of the water should be continued under the direction of a competent engineer employed by the Company pending the installation of permanent improvements. An engineer was engaged and the surveys and preliminary studies were begun on February 6th.

Detailed investigation was made of a large number of the private supplies, especially of those which were suspicious owing to their location or their use by typhoid fever patients. With one exception these private supplies were so far as could be ascertained in no case used by members of more than one family in which typhoid fever occurred. The exception is a spring located at the foot of the bluff near the Glass Works and known as the "Glass Works Spring." This spring was readily accessible and largely used by the employes, although city water was available within the works. Out of 125 employes, 7 were victims of typhoid fever. This fact, however, is less signficant when it is realized that the Glass Works employ about 10 per cent. of the population of the town and the 7 cases represent 8⅓ per cent. of the total number of victims. Nevertheless, the surroundings are such as to render pollution from various sources highly probable during wet weather especially and the spring was condemned and effectually closed.

Repeated warnings were given through the local papers, through placards and verbally to the inhabitants of Parker not to drink any water without boiling.

Sewerage.

Of the 84 cases of typhoid fever which, occurred between November 15th and February 16th, 23 were located on properties on the flats, and 20 of these were on estates which have sewer connections with outlets to the river all above the Water Company's intake.

In view of the general conditions precautions were taken to secure as far as possible the disinfection of all sewage. The local authorities purchased chloride of lime for free distribution and on January 31st delivered a pound package to each of the 278 occupied estates in the city with a printed circular containing the following instructions:

"PARKER CITY BOARD OF HEALTH:—

Please use this package of lime freely and help stamp out the serious epidemic of Typhoid Fever in our city.

We have now 6 per cent. of the entire city infected and to stop the rapid spread of the terrible disease it requires the co-operation of every citizen.

Use the lime very freely in water closets in order that the sewage emptying in the river may have all the pathological Bacteria killed.

Failure to comply with this means imprisonment, as the regular and special Health Officers have been authorized to immediately arrest anybody not complying with the orders of the Board of Health.

BY ORDER OF THE BOARD OF HEALTH.

F. P. Phillips, Secretary."

Night Soil Disposal.

As a part of the general cleaning up policy, the local Board of Health, through its health officers, notified the owners of all overflowing privies to have them immediately cleaned out. In several cases these orders were carried out, but the owners generally waited for the city to designate a dumping ground and to furnish men and teams to do the work. Accordingly the city obtained dumping privileges on the farm of W. E. Allen in Butler County just beyond the city line and a regular scavanger from Butler was assigned to do the work under individual contracts with the property owners. Up to February 17th little progress had been made on this work.

Garbage Disposal.

After persistent demands by the Department's representatives the city officials took steps to carry out the provisions of the garbage ordinances. At a meeting held on the 26th of January, the street commissioner was instructed to at once proceed to put the streets in a more sanitary condition. Placards were posted the following day throughout the city notifying the residents "To clean up their premises at once, burning all refuse possible, and carting all indestructible refuse and garbage outside the city limits and see that it is not deposited near any water course. The cleaning of premises applies to cellars also. By order of Council."

Little or no attention was paid to these instructions, owing to the lack of a public dumping place, until January 30th, when the city obtained dumping privileges on an isolated plot of ground about three miles southwest of the city in Butler County, near a tributary of Bear Creek. On that date the cleaning-up process was begun in earnest. Each property was visited and the occupants given verbal notice to clean up the premises and arrange for the removal of garbage. The street commissioners put two teams into service and the residents, especially on the flats, burned or carted off garbage and refuse in large quantities.

On February 1st, 1911 the following printed warning was posted on telegraph poles and other conspicuous places throughout the city.

"Notice.

"Clean up your premises. Have all refuse and rubbish hauled away.

"All persons not complying with this request at once shall be arrested and dealt with according to law.

"The city has provided a dumping ground on the William Orton farm.

"By Order of

"Board of Health and City Council."

The matter of making permanent provision for the removal and disposal of garbage was discussed at special and regular council meetings and finally on February 9th, a resolution was adopted "That the Street Commissioner be given authority to take full charge of the removal and disposal of private as well as street garbage until Council can have a proper ordinance framed for the complete regulation of the entire garbage matter." On the Minutes of the same meeting occurs the following statement: "Council instructed the Street Commissioner without delay to clean up all hillsides, also river bank and place same in a sanitary condition."

An inspection by Department representatives revealed the fact that the dumping site was located so close to a stream as to inevitably cause pollution. Accordingly, instructions were given to burn all destructible matter which had been there deposited and to select a spot remote from any water course and where the refuse might readily be incinerated. Strict orders were given that all garbage and destructible matter be burned regularly. The local officials later took steps toward acquiring dumping privileges at a suitable point just outside of the western city limit which is here coincident with the Armstrong-Butler County line.

Milk Supply.

The possibility of milk infection was thoroughly studied and the belief was early reached and later strengthened that the epidemic did not come from this source. As a precautionary measure however, the sale of milk in bottles was entirely stopped on January 28th and the dealers and others carefully warned regarding the danger of spreading infection by the interchange of milk vessels.

The slight illness of a man at the Pollock dairy was not diagnosed as typhoid fever but a Widal test was at once made and the result was negative.

On January 28th, 1911, an inspection of the Pollock dairy was made and samples taken of the milk and of the spring water supplied to the milk house. Upon analysis the spring water showed a total of 1,000 bacteria per c. c. and no B. Coli. The milk showed a total count of 5,000 bacteria and no B. Coli.

The number of cases on the routes of the two larger dealers, 37 of Pollock, and 14 for Pryor, was not significant in view of the extent of the epidemic.

Two children in a family from which milk was supplied to three neighbors were suspected of having typhoid fever and the sale of milk immediately stopped until a diagnosis proved that the illness was not typhoid fever. In two instances, namely, Grazier and Grant, Typhoid Fever occurred in families supplying milk to other typhoid cases, but in both of these the onset in the dealers' family occurred after that in the customer's family. One of these private supplies served one outside typhoid case, the other cases in two families. Aside from the two instances mentioned there was no typhoid fever in the family of any dealer. Only two other private dealers beside Grazier and Grant supplied more than one family in which typhoid fever occurred and these each supplied two families.

Conclusions.

The general distribution of cases throughout the town, the use of the public water supply at least occasionally by practically every patient and the fact that a detailed study of the history of each case failed to reveal any other probable common cause, point with reasonable certainty to the conclusion that the epidemic was due to infection of the Allegheny river water served to the public in an unpurified state.

The early cases may have been caused by infection from the sewage of local cases discharged into the river above the intake, but as these early cases were comparatively few in number and scattered in location, the evidence would seem to indicate such an infection as might result from the presence of the numerous cases on the drainage area of the river above Parker. In addition to this there appears to have been a heavy infection of the water supply during the first few days of January resulting in the great number of cases which occurred during the height of the epidemic. This may have been and probably was caused by the known discharge of local typhoid infected sewage at a point where it must inevitably reach the water works intake.

The secondary cases very largely received their infection before the townspeople generally realized the serious nature of the epidemic and were due mainly to ignorance or disregard of the proper precautionary measures.

The fairly general observance of the warnings of the local Board of Health to boil all water used for domestic purposes appreciably checked the epidemic and the treatment of the water supply with a germicide upon the arrival of the Department's representatives seems to have resulted in effectually preventing new primary cases. The enforcement of precautionary measures and the excellent service rendered by the visiting nurse soon reduced the occurrence of secondary cases to a minimum.

Decrees of the Commissioner of Health.

On March 29th, 1911, the Parker City Water Company in following out the orders issued by the Commissioner of Health to it, submitted for approval plans and specifications prepared by a competent sanitary engineer employed for the purpose, for a modern water filter plant installation for Parker. These plans were reviewed by the Commissioner of Health and the Chief Engineer, and it was agreed and determined by the Department that the plans should be approved, and they were approved and a permit issued therefor subject to the following conditions and stipulations:

"FIRST: That the Parker City Water Company shall proceed immediately to install and operate the proposed filter plant and that the Commissioner of Health shall be notified at a sufficient time in advance of the date on which it is proposed to put the filter plant in commission in order that he may have a representative on the ground at the start of the plant.

"SECOND: As soon as the filter plant is built it shall be operated thereafter and at no time shall the water company introduce unfiltered water into its water works system.

"THIRD: The filter plant shall be operated under the responsible direction of an expert employed by the water company for at least six months after it is put in commission and daily records of the operation of the pumping station, filter plant and water works system shall be kept on blank forms satisfactory to the State Department of Health and copies thereof shall be filed weekly in the office of the Commissioner of Health.

"FOURTH: If at any time in the opinion of the Commissioner of Health the water works system or any part thereof, or the water supplied thereby has become prejudicial to public health, then such remedial measures shall be adopted as the Commissioner of Health may advise or approve.

FIFTH: The existing filter unit is to be dismantled and entirely abandoned by the time the filter plant hereby and herein approved is built, but this old filter should be kept in use at least up to the time that construction work on the new filter is begun, in order to obtain any slight advantage in the clarifying of the water that it may assure. The treatment of the water by the hypo-chlorite of lime process must continue until after the new filter plant has been installed and put into successful operation. Daily records of the use of this process shall be kept and satisfactory reports thereof shall be filled in the office of the Commissioner of Health each week.

"The State Department of Health will cause the discontinuance of the discharge of sewage into the Allegheny River or its tributaries at any and all points in Parker City above the water company's intake in the river."

The filters were built and put in operation before the end of the year.

On March 31st, 1911, by agreement of the Governor, Attorney General and the Commissioner of Health, a decree relative to sewerage was issued to the city of Parker. This decree was in the nature of a report discussing the general sanitary situation. The following is a true copy.

"The assessed valuation of the city of Parker is about $225,000 which represents a legal bonding possibility of $18,000. The present bonded indebtedness amounts to $6,500. There are outstanding orders amounting to about $3,000 which are off-set by assets amounting to $8,000. Of the latter amount $4,000 represents unpaid taxes from 1909 to 1911. To collect which there has been little or no effort made. A little over $3,000 represents the taxes due for collection after March 1st, 1911. There is practically no cash in the city treasury and the expenses incident to the recent typhoid fever epidemic were met by interest bearing orders. An earnest attempt to realize upon these assets should place the city in a much better financial condition. However, the bonded indebtedness does not make available at the outside, if every dollar were raised, much over the sum of $12,000. This amount could be made available for sewerage purposes. This would be insufficient to pay for a sewer system and sewage disposal plant, but the borough is capable of having plans prepared for a comprehensive system and then to proceed to build such sewers as are absolutely necessary from time to time in conformity with the plan.

"The proposed Washington Avenue sewer was denied because it was designed to carry both sewage and storm water which would practically preclude ultimate treatment of the sewage, because of the prohibitory cost of building works to treat mingled sewage and storm water.

"Although until recently little interest has been taken in improving sanitary conditions, people now have waked up to a better realizing sense of the danger of having their private sewer outlets into the river above the town's water works intake.

"The extremely unsanitary condition at the foot of the bluffs is due to the discharge of sewage above and should be stopped. During the summer months Church Run is nearly dry and the sewage discharged into it from private dwellings forms pools and pollutes the banks until rain comes and washes it away. Cesspools and abandoned wells in proximity to the private wells from which water is drawn for drinking are used as receptacles for sewage thus imperilling the health of those who drink the water drawn from neighborhood wells. What is needed in Parker to prevent other epidemics, is the discontinuance of the discharge of sewage into State waters, except, possibly, into the river at one point below the water works intake, the abandonment of a number of wells on private properties, and more attention paid to the enforcement of health rules and regulations.

"From the city of Parker down stream to the mouth of the Allegheny River at Pittsburgh, a large number of towns use the water for drinking purposes. At the borough of Kittanning about 31 miles down stream, approximately 6,000 people rely upon the river for the supply. At the borough of Ford City, about 10 miles further down stream, the river water is served to over 4,000 people, after having passed through a gravel crib in the bed of the river. At Freeport, 53 miles below Parker City, filtered river water is supplied to the inhabitants and from Freeport to Pittsburgh a distance of about 30 miles, in the neighborhood of 600,000 people rely upon river water for all domestic purposes.

"So not only is public health in Parker imperilled by the city's own sewage, but the health of the public in towns farther down stream is also more or less menaced by Parker's sewage. It is the State's policy to preserve the purity of the waters of the Allegheny and plans must be devised by the towns along its banks to ultimately discontinue the discharge of sewage into the river.

"At Parker, one of the first things to be done is to construct an intercepting sewer along the river flats to take the flow from all private sewers now emptying into the river above the water works intake, and to convey this sewage into the river below said water works intake. This should be done in such manner that this intercepting sewer shall be a part of the complete system of sanitary sewerage for the entire borough and as a part of a plan for the ultimate treatment of the town's sewage. To carry out such an idea means the employment by the city of an engineer skilled in the design and construction of such works and when the plans are prepared, they should be submitted to the Commissioner of Health for approval. If the local authorities neglect to proceed in this manner, then the State will be forced to compel every owner and user of a private sewer to discontinue the discharge into State waters and to dispose of the sewage at his own proper cost and expense. Probably this will mean the building of large water tight vaults at each property and the pumping out of the contents at regular intervals and its cartage away to some more extended area where it can be filtered and purified without endangering public health. This would mean also that properties connected to the storm drains must sever the connection for any sewage.

"The State has compelled the water company to build a modern water purification plant and plans for this improvement are now before the Department for acceptance.

"In considering a comprehensive sewerage system and site for disposal works, the Department will be glad to advise and consult with the borough's expert. In the matter of the selection of a site for the disposal works, the choice is limited, owing to the close approach of the bluff to the river shore at the lower end of the city. It will probably be necessary to pump the sewage from the low portion of the city to the disposal works whatever site is selected. It is also possible that the sewage from the upper districts can be delivered by gravity to the works.

"The discharge of sewage over the bluffs and into the runs must be discontinued. If the requisite money is not forthcoming to do this by a public system at first, then the cost must be assumed by the individual property owner. But in the consideration of the entire subject, the local authorities will find considerable aid to a conclusion in having in their possession plans for a comprehensive sewerage system with estimates of cost.

"In view of the foregoing circumstances, I hereby and herein issue a decree to the local authorities of the city of Parker to the effect that the city shall forthwith proceed to carry out the suggestions hereinbefore given relative to the improved sanitary conditions and the preparing of comprehensive plans for sanitary sewerage and sewage disposal works, and that the city shall submit to the Commissioner of Health for approval on or before the first day of July 1911, plans for a comprehensive system of sewerage and sewage disposal works and estimates of cost, and when such plans have been considered by the Commissioner of Health, a permit may be issued for the temporary discharge of sewage into the Allegheny River below the mouth of Church Run.

"If plans are not submitted on or before said July 1st, 1911, then the Commissioner of Health will proceed to order the discontinuance of the use of every private sewer now discharging directly or indirectly into State waters within the limits of the city."

31. TYPHOID FEVER AT PATTON.

During the early part of October, inspectors of the Engineering Division of the State Department of Health were engaged in making sanitary inspection of the watershed of Chest Creek from which the Patton Water Company of Patton borough, Cambria County, obtains its source of supply to the public in said borough. On October 7th, the inspector in charge informed the Department that there was considerable typhoid fever in Patton among users of the public water supply and that the water company as well as the borough authorities were alarmed.

Complants had been previously received from the consumers setting forth that the water at times was very turbid, that the character of the watershed was such that the supply was contaminated by drainage from occupied estates on the area and that the water had been the cause of transmitting disease to the town. Bacterial examinations of samples of water collected by the Department on Sept. 6th and 23rd, showed the presence of sewage pollution in both the public water supply and in well waters in the borough. This was the reason why the Department's field officers were engaged in making the sanitary survey and in removing sources of pollution on the watershed.

On October 9th, Assistant Engineer, Ralph E. Irwin was sent to Patton to direct a thorough investigation relative to typhoid fever. The following report of the conditions and operations of the Department was prepared by Mr. Irwin.

General Conditions.

The borough of Patton is located in the north central part of Cambria County. The incorporated area of about 450 acres, includes parts of what were formerly Carroll, Clearfield, Elder and Chest Townships, the junction of the four townships being at this point. The borough was located and surveyed by the Pennsylvania Coal and Coke Company. The first house was built in 1892 and the borough incorporated in 1893. The present population is 3,976 of whom probably 3,000 are foreigners. The majority of the inhabitants are dependant upon the Penna. Coal and Coke Company for employment in mines near by. Other industries worthy of mention are The Patton Clay Co., employing 375; the E. & N. Levy Silk Mill, employing 70 and The Patton Brewing Company with 18 employees.

The surrounding country is very hilly and mountainous. The slopes are mostly under cultivation and dotted here and there with mine openings. Chest Creek, which drains an area of 44 square miles to the south of the borough limits, is formed at Bradley's Junction, 7 miles south of Patton by the union of 2 small streams, one rising 4 miles to the south west in Cambria township and the other rising 5 miles to the south east in Allegheny township. Chest Creek takes a northerly course through the borough and joins Brubaker Run near Garway and finally enters the West Branch of the Susquehanna River at Mahaffey borough about 18 miles north of Patton. Little Chest Creek, draining an area of about 6 square miles to the south west of Patton, enters Chest Creek within the borough limits, near the southern boundary. Also Flannigan Run, a small tributary enters Chest Creek within the borough limits near the northern boundary.

Two railroad inlets are afforded. The Cambria & Clearfield branch of the P. R. R. passes through Patton along the bank of Chest Creek on its way from Cresson to Glen Campbell. The N. Y. Central & Hudson R. R. enters the borough using the P. R. R. tracks from Mahaffey to Patton. Also trolley connections are afforded with the boroughs of Carrolltown, Spangler and Barnesboro.

The borough presents the appearance of a well built and substantial coal mining centre. The business section is on Magee Ave., from the P. R. R. station to 7th Ave. and on 5th Ave. from Palmer Avenue to Lang Avenue. Surrounding this business section is the residental portion of the borough. The west-central and east-central parts of the built up portion of the borough are on hill sides sloping toward Chest Creek or its tributaries within the borough. In the west portion are found the better constructed residences. To the north and south of the business streets the built up sections are on low ground, of poor construction and difficult to keep in sanitary condition.

The assessed valuation was given by the borough Attorney as $730,444 and the bonded-indebtedness $25,400. It was stated that these bonds were issued mainly for the construction of the municipal sewers and the paving of streets.

The borough officials are as follows:
Burgess, Jerry Ford.
Pres. Council, Geo. E. Prindible.
Sec. Council, D. G. Felker.
Treas. Council, F. H. Kinkead.
Attorney for Council, R. Somerville.
Member Council, M. M. Nolan.
Member Council, E. A. Miles.
Member Council, T. N. Nagle.
Member Council. R. L. Gauntner.
Member Council, A. G. Anderson.

Board of Health.

President, Ruel Somerville.
Sec. and member, H. C. Yearger
H. O. and member, S. W. Worrell
Member, A. I. Brown.
Member, J. Edmonson.

The Bureau of Vital Statistics of the Department of Health has the following typhoid fever records for Patton beginning October 1905 to November 1911, as follows:

Month.	1905	1906	1907	1908	1909	1910	1911
January,	—	0	—	0	—	0	—
February,	—	—	—	0	—	0	0
March,	—	—	—	0	—	2	2
April,	—	—	—	—	—	0	—
May,	—	—	—	0	—	0	—
June,	—	—	—	—	0	0	—
July,	—	—	—	—	—	—	2
August,	—	—	1	—	—	—	1
September,	—	—	1	—	0	—	2
October,	0	—	—	—	—	—	19
November,	0	—	—	—	0	—	—
December,	0	—	—	—	0	—	—
Total,	0	0	2	0	0	2	26

In making a canvass among the borough physicians concerning the number of typhoid fever cases during the early part of the year it was found that 24 cases had been treated other than the two shown on the record of the local board of health and the Bureau of Vital Statistics. It was impossible to secure information concerning these cases because many were foreigners and others had removed from the borough. The information designated on the census cards was obtained from the house-holds where fever cases occurred during 1911 from July 1st to December 1st inclusive.

The table shows a digest of this information.

As previously stated prior to July first there were 26 cases of typhoid fever in the borough. Twenty-four of these cases did not appear on the record of the Local Board of Health or the Bureau of Vital Statistics. The following table gives the name and age of the patients, the date first treated and the water supply used at the home. This information was all obtained from the physician. The physician giving the information is indicated as the attending physician. In the column designating date of positive Widal is shown the dates on which positive Widal tests were made at the Department's laboratory for 9 of the 24 cases.

Physicians' Report of Typhoid Fever not Reported to Department by Local Board of Health. July, 1911.

Name.	Date first treated.	Age.	Water at house.	Attending Physician.	Date of positive widal.
Guy Schettig,	Jan. 1	23	City,	W. A. Blair,	
Clara N. Moore,	Jan. 17	38	City,	J. I. VanWert,	
Ester Forsburg,	Feb. 13	13	City,	J. A. Murray,	March2–3
Charles Austin,	Feb. 19	10	City,	J. A. Murray,	
Brennard Smithbauer,	Feb. 19	5	City,	J. I. VanWert,	
Jennie Russel,	Feb. 14	14	City,	J. A. Murray,	
Wilda Dingle,	Feb. 22			J. I. VanWert,	
Wilford Dietrich,	March	24	City,	J. A. Murray,	March 7
James LaCava,	March 7			J. A. Murray,	Mar. 6–7
Clementine Smithbauer,	March 8	8	City,	J. I. VanWert,	
Mary Russell,	March 8	33	City,	J. A. Murray,	March 8
Evangeli Santonette,	March 25	8	City,	J. A. Murray,	
John Donahue,	March 29	39	City,	B. F. Shirer,	
Patrick Donahue,	April 1	14	City,	B. F. Shirer,	
Fadaline Donahue,	April 1	1½	City,	B. F. Shirer,	
Vernon Donahue,	April 1	7	City,	B. F. Shirer,	
W. J. Fisher,	April 1	40	City,	W. A. Blair,	
Clara Cole,	April	39	City,	J. A. Murray,	March 31
Anna Dominick,	April 14			J. A. Murray,	April 14
Virginia Cooper,	April 19			J. A. Murray,	April 20
Mrs. John Wathes,	April 25			J. A. Murray,	April 25
Agnes Martin,	May 9	34	City,	J. A. Murray,	May 9
Thomas Jones,	June 14	17	City,	W. A. Blair,	
Mrs. Anna Christoff,	June	35	City,	S. W. Worrell,	

In examining these data it will be found that the 24 cases were distributed among five borough physicians as follows:

J. A. & V. A. Murray,	12
J. I. Van Wert,	4
W. A. Blair,	3
B. F. Shirer,	4
S. A. Worrell,	1

It would seem improbable that a physician would receive positive Widal reports from the State Department's Laboratory and not report the cases to the Local Board of Health, but such appears to be the fact.

Of the 43 cases occurring from July first to December first inclusive 18 do not appear on the record of the Bureau of Vital Statistics. Eight of the 18 were reported to the Local Board of Health as the cards sent by the physicians to the Local Board of Health were obtained from the Local Board of Health Office. One of the 18 cases occurred in Carroll Township a short distance from the borough limits and it would not properly belong to the cases recorded in the office of the Local Board of Health. We have then until December first, 1911 a record of 69 cases, 68 of which should appear on the record of the Local Board of Health. But 33 cases of the 68 appear on the Local Board record. The cases of Fred Williams (No. 39) was not reported to the Local Board of Health by Dr. Blair as the patient was sent to Spangler Hospital before the diagnosis of typhoid fever was made. The case diagnosed as that of typhoid fever at Spangler Hospital properly belongs among the Patton cases. All of the other cases are said to have been reported by the physicians to the Local Board of Health.

The Secretary of the Local Board of Health claims the physicians did not report the cases to him. In this connection it should be noted that the active members of the Local Board of Health are almost wholly dependent upon the Pittsburgh Coal and Coke Co. for employment and that the water company is controlled by the Pittsburgh Coal and Coke Company. It is very apparent that the dominating factor in the Local Board of Health is the Superintendent of the Pittsburgh Coal and Coke Company who is also Secretary and Treasurer of the water company. There appears to be some truth in the statement made by several citizens that the influence of the coal company and water company upon the Local Board of Health was such as to destroy the accuracy of the records of the Local Board of Health even though cases of contagion and water borne disease were reported by the physicians to the Local Board of Health. It is believed that the cases reported as typhoid fever by the physicians to those making the local investigation were true cases of typhoid fever and this belief is substantiated by the fact that 12 of these cases gave positive Widal reaction by examination made at the Department's laboratory.

The occupation of the 43 typhoid fever cases occurring July 1 to December 1 were as follows:

Pupils,	11
Miners,	10
Housewives,	10
Laborers,	4
Children,	2
Clerks,	2
Stable Boy,	1
Driver,	1
Supt. of Brewery,	1
Teacher,	1
Total,	43

The following table gives the number of cases according to age and sex that occurred July first to December first:

Age	M	F	Total
0— 4	0	0	0
5— 9	4	2	6
10—14	2	4	6
15—19	7	0	7
20—24	4	2	6
25—29	4	2	6
30—34	2	4	6
35—39	0	1	1
40—44	2	0	2
45—49	1	1	2
50—over	..	1	1
Total,	26	17	43

PATTON TYPHOID FEVER CENSUS CARD. INFORMATION CONCERNING FORTY-THREE CASES OF FEVER OCCURRING BETWEEN JULY FIRST AND DECEMBER FIRST.

Number.	Name.	Address.	Date on Dept. Record.	Date of onset.	Sex.	Age.	Employment.	Other cases in household.	Trained Nurse.	Treated at.	Sanitary Conditions.	Sewer Connection.	Physician.	Water supply at home and work.	Disposal of excreta.	Milk supply.	Ice supply.	1911. died.	Widal test positive.	Remarks.
1	Vera Brant,	Palmer Ave.,		July 1,	F	7	Child,	1		Home,	Fair	No	B. F. Shirer,	Dug well,	Privy,	F. Dietrich,	Manf.,	Rec.,		
2	Ed. Donahne,	Palmer Ave.,		July 4,	M	26	Miner,	4		Home,	Fair	Yes	W. A. Blair,	City,	Privy,	J. W. Bender,	Manf.,	Rec.,		
3	Pios Yahner,	Beach Ave.,		July 5,	M	31	Miner,	0		Home,	Fair	Yes	J. I. Van Wert,	City. Well. Spring,	Privy,	J. W. Bender,	Manf.,	Rec.,		
4	Iva Trinkley,	W. 6th Ave.,	July 19,	July 19,	F	20	Housewife,	2		H. C. Lanberry,	Fair	Yes	S. W. Worrell,	City. Dug well. Spring,	Sewer,	Own cow,	Manf.,	Died, July 30,		
5	Wm. Maanon,	W. 6th Ave.,	July 26,	July 26,	M	19	Stable boy,	2		H. C. Lanberry,	Fair	Yes	S. W. Worrell,	Dug well. Spring,	Sewer,	Own cow,	Manf.,	Rec.,		
6	Wm. Trinkley,	W. 6th Ave.,	Aug. 1,	Aug. 1,	M	21	Clerk P. R. R.,	2		H. C. Lanberry,	Fair	Yes	S. W. Worrell,	City. Dug well. Spring,	Sewer,	Own cow,	Manf.,	Rec.,		
7	Mrs. Mary Cole,	4th Ave.,		Aug. 1,	F	70	Housewife,	1		Home,	Fair	Yes	V. A. Murray,	City,	Privy,	F. Dietrich,	Manf.,	Died, Aug. 14,		
8	Amole Lingle, Jr.,	Carroll Twp.,		Aug. 4,	M	15	Child,	0		Home,	Fair	No	V. A. Murray,	City,	Privy,	Henry Fox,	None,	Rec.,	Aug. 14,	Lived short distance outside of borough.
9	Mrs. Geo. Sheka,	Mellon Ave.,		Aug. 3,	F	45	Housewife,	0		Home,	Fair	No	V. A. Murray,	Dug well,	Privy,	S. Fadora,	None,	Rec.,	Aug. 8,	
10	Mrs. B. F. Brant,	Palmer Ave.,		Aug. 10,	F	31	Housewife,	1		Home,	Fair	No	V. A. Murray,	Dug well,	Privy,	F. Dietrich,	Manf.,	Rec.,	Aug. 17,	
11	Hulda Cole,	4th Avenue,		Aug. 14,	F	33	Housewife,	1		Home,	Fair	Yes	J. I. Van Wert,	City,	Privy,	F. Dietrich—Mrs. J. Trinkley,	Manf.,	Rec.,		Nursed Mrs. Mary Cole who took sick August 1. Probable case contact.
12	Clinton Cartwright,	Magee Ave.,	Sept. 5,	Sept. 1,	M	7	Child,	1		Home,	Fair	No	V. A. Murray,	City. Dug well,	Privy,	Anthony Good,	Manf.,	Rec.,	Sept. 6,	Well filled by order of physician in September.
13	John Fisher,	6th and Land,		Sept. 7,	M	40	Miner,	0		Home,	Bad	No	W. A. Blair,	Dug well. City,	Privy,	J. W. Bender,	Manf.,	Rec.,		
14	Leo Laughlin,	4th Avenue,		Sept. 10,	M	25	Laborer,	0	None at home	Spangler Hospital,	Fair	Yes	J. I. Van Wert,	Dug well,	Sewer,	J. W. Bender,	Manf.,	Died, Oct. 20,		
15	John A. Urich,	5th and Palmer,	Oct. 11,	Sept. 20,	M	40	Laborer,	0		Home,	Good	Yes	J. I. Van Wert,	City,	Sewer,	F. Lehman,	Manf.,	Rec.,		
16	Mrs. Homer Wilson,	Magee Ave.,	Oct. 2,	Sept. 23,	F	23	Housewife,	0	E. P. Behe	Home,	Good	Yes	W. A. Blair,	City,	Sewer,	J. Fox,	Manf.,	Rec.,		In Johnstown within 30 days.
17	Gladys Fuller,	Kerr Ave.,	Oct. 2,	Sept. 24,	F	13	Child,	0		Home,	Bad	No	W. A. Blair,	Dug well. City,	Privy,	I. J. Hoover—Mrs. Gramy,	Manf.,	Rec.,		
18	Samuel Bailey,	W. 6th Ave.,	Oct. 2,	Sept. 25,	M	26	Miner,	0		Home,	Bad	Yes	B. F. Shirer,	Spring. City,	Privy,	W. H. Karlheim,	None,	Rec.,		
19	Mrs. Sena Erickson,	Magee Ave.,	Oct. 2,	Sept. 26,	F	26	Housewife,	0		Home,	Good	Yes	V. A. Murray,	Spring,	Sewer,	J. Haily,	Manf.,	Rec.,		
20	Mrs. Emily Broggaln,	5th and Beach,	Oct. 2,	Sept. 27,	F	28	Housewife,	0	None at home	Spangler Hospital,	Fair	Yes	J. I. Van Wert,	City,	Sewer,	I. J. Hoover,	Manf.,	Rec.,		
21	Ruth Lannon,	W. 6th Ave.,	Sept. 28	Sept. 28,	F	11	Child,	0		Home,	Bad	No	V. A. Murray,	City,	Burry,	Anthony Good,	Manf.,	Rec.,		
22	Catherine Lilly,	Lang Ave.,	Oct. 2,	Sept. 28,	F	14	Child,	0		Home,	Bad	No	J. I. Van Wert,	City. Dug well,	Burry,	J. W. Bender,	Manf.,	Rec.,		
23	Robert Mattey,	W. 6th Ave.,	Oct. 3,	Sept. 29,	M	15	Driver of del. wag.	0		Home,	Good	Yes	V. A. Murray,	Spring. City,	Privy,	W. H. Karlheim,	Manf.,	Rec.,		
24	Wm. Callahan,	Beach Ave.,	Oct. 5,	Sept. 30,	M	16	Miner,	2		Home,	Bad	No	J. I. Van Wert,	Spring,	Privy,	W. H. Karlheim,	Manf.,	Rec.,		
25	Gabriel Vaccare,	5th Avenue,	Oct. 9,	Sept. 30,	M	21	Laborer,	0		Home,	Bad	No	J. I. Van Wert,	City,	Privy,	I. J. Hoover,	Manf.,	Rec.,		
26	Anna Caputo,	W. 6th Ave.,	Oct. 1,	Oct. 1,	F	11	Child,	1		Home,	Bad	No	S. W. Worrell,	City,	Privy,	J. Steve,	Manf.,	Rec.,		
27	Sylvester Earheart,	Beach and 6th,	Oct. 8,	Oct. 3,	M	10	Child,	1		Home,	Good	Yes	B. F. Shirer,	City,	Sewer,	J. W. Bender,	Manf.,	Rec.,		
28	Imidea Caputo,	W. 6th Ave.,	Oct. 11,	Oct. 3,	M	7	Child,	1		Home,	Bad	No	S. W. Worrell,	City,	Privy,	J. Steve,	Manf.,	Rec.,		
29	Martin Good,	6th and Magee,	Oct. 9,	Oct. 4,	M	18	Miner,	0		Home,	Fair	No	J. I. Van Wert,	Spring. City,	Burry,	Own cow,	Manf.,	Rec.,		Exchanged milk vessels with Cartwright and Lannon.
30	Geo. Linbacker,	4th Avenue,	Oct. 10,	Oct. 5,	M	46	Sup. of Patton Bre.	0		Home,	Good	Yes	V. A. Murray,	Spring. City,	Sewer,	I. J. Hoover,	Manf.,	Died, Oct. 16,	Oct. 9,	Father a dairyman.
31	Ordell Eubo,	Magee Ave.,	Oct. 10,	Oct. 6,	M	19	Restaurant,	0		Home,	Fair	No	W. A. Blair,	Dug well. City,	Sewer,	W. H. Karlheim—D. Fadora,	Manf.,	Rec.,		
32	Chas. Nashwinter,	Lang Ave.,	Oct. 10,	Oct. 6,	M	27	Miner,	0		Home,	Good	No	S. W. Worrell,	Spring,	Burry,	W. H. Karlheim,	Manf.,	Rec.,	Oct. 19,	
33	Ruth Murray,	Beach Ave.,		Oct. 7,	F	20	Teacher,	0	None at home	Johnstown Hospital,	Good	Yes	J. I. Van Wert,	City,	Sewer,	I. J. Hoover,	Manf.,	Rec.,		
34	James Whiteford,	W. 4th Ave.,	Oct. 10,	Oct. 7,	M	18	Miner,	0		Home,	Bad	No	W. A. Blair,	Spring,	Burry,	I. J. Hoover,	Manf.,	Rec.,		Visited Spangler within 30 days.
35	Mary Callahan,	Beach Ave.,		Oct. 7,	F	8	Child,	2		Home,	Bad	No	J. I. Van Wert,	City,	Privy,	W. H. Karlheim,	Manf.,	Rec.,		
36	Mrs. Wade Mathews,	6th and Bussell,	Oct. 11,	Oct. 8,	F	20	Housewife,	0	Mrs. E. Elliott	Home,	Good	Yes	J. A. Murray,	City,	Sewer,	J. Shien,	Manf.,	Rec.,	Oct. 25,	
37	James Callahan,	Beach Ave.,		Oct. 8,	M	5	Child,	2		Home,	Bad	No	J. I. Van Wert,	City,	Privy,	W. H. Karlheim—J. Farbaugh,	Manf.,	Rec.,		
38	Mike Hopkins,	Beach Ave.,		Oct. 9,	M	24	Miner,	0		Home,	Bad	No	J. I. Van Wert,	Spring. City,	Privy,	W. H. Karlheim—W. H. Karlheim,	Manf.,	Died, Nov. 15,		
39	Fred Williams,	W. 6th Ave.,		Oct. 10,	M	30	Miner,	0	None at home	Spangler Hospital,	Bad	No	W. A. Blair,	City,	Privy,	Anthony Good,	Manf.,	Rec.,		
40	Clara Cartwright,	Magee Ave.,		Oct. 12,	F	5	Child,	1		Home,	Fair	No	J. A. Murray,	Dug well,	Privy,	Mrs. J. Trinkley,	Manf.,	Rec.,	Oct. 23,	Probable contact with brother having onset September 1.
41	Morgan Earheart,	Beach and 6th Ave.,		Oct. 14,	M	13	Child,	1		Home,	Good	Yes	D. F. Shirer,	City,	Sewer,	J. W. Bender,	Manf.,	Rec.,		
42	Mrs. Thom. Guera,	3rd Ave.,		Oct. 24,	F	39	Housewife,	0		Home,	Fair	No	S. W. Worrell,	City,	Privy,	Own cow,	None,	Rec.,		
43	Fred McQuillen,	Magee Ave.,		Oct. 25,	M	23	Laborer,	0		Home,	Bad	No	S. W. Worrell,	City. Spring. Dug well,	Privy,	W. H. Karlheim—I. J. Hoover,	Manf.,	Rec.,		

From the foregoing table it will be noted that fever cases were distributed fairly evenly according to sexes. The distribution according to age is that of a normal typhoid fever outbreak, 37 of the 43 cases occurred between the ages of 5 and 35, each 5 year period having 6 cases with the exception of those between the ages of 15 and 19 inclusive when there were 7 cases. There were no patients under 5 years of age. This would indicate that the infection was not attributable to the milk supply.

In the following table the 43 typhoid fever cases occurring July first to December first are given according to the day of the month on which they occurred:

Day	July	Aug.	Sept.	Oct.
1,	1	2	1	1
2,	..	..	..	..
3,	..	1	..	2
4,	1	1	..	1
5,	1	..	..	1
6,	..	..	..	2
7,	..	..	1	3
8,	..	..	..	2
9,	..	..	..	1
10,	..	1	1	1
11,	..	..	..	..
12,	..	..	..	1
13,	..	..	..	..
14,	..	1	..	1
15,	..	..	..	..
16,	..	..	..	..
17,	..	..	..	..
18,	..	..	..	..
19,	1	..	..	..
20,	..	..	1	..
21,	..	..	..	..
22,	..	..	..	..
23,	..	..	1	..
24,	..	..	1	1
25,	..	..	2	1
26,	1	..	..	..
27,	..	..	1	..
28,	..	..	2	..
29,	..	..	1	..
30,	..	..	2	..
31,	..	..	..	..
	5	6	14	18

From the foregoing table it will be noted that there was no sudden out-break, the cases beginning gradually and falling off rapidly. It is thought that the explanation is given for the falling off of the cases under the discussion dealing with the public water supply.

Possible Sources of Infection.

The date of occurrence and the extent and the distribution of the cases indicate some general infection of mild character and probably long and intermittant duration. The following possible sources of infection were considered:

1. Green vegetables and fruit.
2. Ice and ice-cream.
3. Flies.
4. Personal contact.
5. Sanitary conditions and sewage disposal.
6. Milk supply.
7. Public water supply.
8. Individual water supply.

Green Vegetables and Fruit.

Green vegetables were used by almost all of the households in which typhoid fever occurred. In most cases the vegetables were raised in their own gardens or purchased from neighbors having gardens. It does not seem possible that any general infection could have occurred in this way. Fruit was obtained from fruit venders about the borough during the season in which the greater part of the fever occurred, much fruit was used and had it been infected the distribution of cases according to date of onset would have been different, the out-break being more sporatic.

Ice and Ice Cream.

The only ice supply used for the borough of Patton was that obtained from the Patton Brewing Company. This ice was manufactured by the company and the water used in making the ice was obtained from a deep well at the company's plant. The water was distilled and frozen in the manner usual in making artificial ice. All but 4 of the 43 fever cases had used ice from this company. The brewery is located in the north-central part of the town and surrounding it are many of the poorer residences inhabited by the foreigners. These people were allowed to come to the brewery and carry away the ice as needed. The Brewery Company also delivered ice about the borough from a wagon and sold to the greater part of the inhabitants as the ice supply was in almost universal use throughout the whole summer. The process of manufacture and method of handling did not indicate any possibility of the ice being a carrier of infection.

Until about the first of August the only ice cream supply for the borough was obtained from Samuel Albert. Mr. Albert was until that time in charge of a bakery and ice cream plant combined. He furnished ice cream at wholesale rates for public parks, local hotels and various picnics throughout the summer. He also did a large retail business, selling to the residents and served ice cream in an ice cream parlor in connection with the bakery. After the first of August Mr. Albert started a confectionery store and sold ice cream at both retail and wholesale from this place, the ice cream was however, manufactured at the plant in connection with the bakery as before.

The cream for the purpose of making ice cream was obtained by Mr. Albert from various farmers, some of whom sold cream within the borough. The dairy men selling cream within the borough from whom the cream was usually obtained were Hoover and Bender. It was known among cream dealers that they could sell to Mr. Albert any cream they had remaining after the day's delivery and a considerable amount of the supply for the ice cream plant was obtained in this way, and because of this method it was difficult to show the amount and times that milk was obtained from any one dealer.

Ten fever cases were served with ice cream on the dates as follows: July 19, 20; Aug. 1, 14; Sept. 1, 25, 28, 29; October 7 and 10th.

Because of the few fever patients who had used ice cream, the long period covered by days of onset of those using ice cream and the fact that the cream was in general use about the borough it is thought that little or no fever could be traced to this source.

Flies.

Flies were prevalent throughout the borough during the entire period of the infection of the cases investigated. The sanitary condition of the borough was such that fly infection was possible.

In considering the possibility of fly infection all of those localities were studied where fever patients were located in more than two houses in close proximity.

In one locality 5 cases occurred, dates of onset being as follows: Sept. 10, 23, 25; Oct. 6, 25. The case of Sept. 10th was that of Leo Laughlin who was taken to the hospital on Sept. 29. The Laughlin property was connected with the sewer and sanitary conditions were fair. It is not probable any fly infection could have come from this property. The cases of Sept. 23rd and 25th were that of Mrs. Homer Wilson and Mrs. Sena Erickson. The properties where both of these cases were located were connected with the sewer and the sanitary conditions were good. It is improbable that fly infection could have occurred at these two places. The other two cases were of October 6 and 25th. The case of Oct. 6th was located on a property connected with a sewer and in good sanitary condition where fly infection was almost impossible.

The second locality considered was that where cases occurred on July 19 and 26; Aug. 1st; October 1st, 2nd and 3rd.

The cases dated July 19, 26; Aug. 1st were located on the same property. This property was connected with a sewer and the sanitary conditions were fair. It is thought that there was little probability of fly infection occurring in this place. The case dated September 25th was located on the proprty where there was a sewer but a privy was also in use. The sanitary conditions were bad and fly infection was possible. On October first 3 cases of fever occurred in the Caputo family and on October 3rd a case in the Mattey family. It is possible that the three cases may have been caused by infection carried to their home from the Bailey property.

The third locality is that where cases occurred on Sept. 28; October 1, 14. On September 28th a case occurred in the Lilly family where there was no connection with a sewer and the sanitary conditions were exceedingly bad. Here fly infection was possible and the two cases in the Earhart family occurring on the 1st and 14th may have occurred in this way.

The other cases were scattered throughout the borough and were located at such distances from each other that it is probable that infection was not carried by flies from one house to another.

Personal Contact.

Because the dates of onset of the 43 cases investigated were distributed over the time between July 1st and October 25th inclusive it was thought that a number of the cases were probably due to contact. To establish connection cases occurring in the same household, the same neighborhood or having relatives sick with typhoid fever were especially investigated regarding this point.

It was found that in the Lansbury household 3 cases occurred with dates of onset on July 19th, 26th and August 1st. It is possible that the case of August 1st might have been a contact case. Also on the same side of the street nearby occurred the case of Robert Mattley, on September 29th across the street the case of Samuel Bailey occurred September 25th. While these last two cases were nearby it could not be shown that there was any possibility of contact with the cases in the Lansbury home. About one block from the Lansbury residence were two cases in the family of Patrick Caputo occurring on October 1st and 3rd. These cases were those of children 8 and 11 years of age. There were 8 members of this family and no other cases occurred. Little is known regarding the meanderings of these two Italian children and it is possible that they were frequently in the household of the Lansbury family where there were other children about the same age although the older members of the family had little, if any, communication. It should be noted, however, that there were no other cases among the children of this neighborhood.

Mrs. Homer Wilson with date of onset September 28th visited her brother, Mr. Leo Laughlin, whose date of onset was September 10th. There being 13 days between the dates of onset of these two cases it is possible that the case of Mrs. Wilson may be a secondary case. In the same neighborhood occurred the cases of Ordell Kuhn and Fred McQuillen, having dates of onset October 6th and 25th respectively. No information was obtained establishing infection by contact for Mr. Kuhn, but it was learned that Mr. McQuillen visited Mr. Laughlin before Mr. Laughlin was taken to the hospital September 29th. There were then at least 26 days between the time Mr. McQuillen last saw Mr. Laughlin and the date of onset. This seems rather a long period of infection and it is hardly possible to call this a contact case.

In the home of John Callahan occurred 3 cases among his children, the dates of onset being September 30th and October 7th and 8th. It is hardly possible that the two October cases could have been infected by the case dated September 30th unless the fever had been in progress a number of days before the date of onset was established.

In the home of Elijah Cartwright were the cases of two children, dates of onset being September 1st and October 12th. In this instance it is possible that the case of October 12th was due to contact with that of September 1st.

In the home of Samuel Wheatland occurred the case of the two Earhart children, the dates of onset being October 3rd and 24th. In this instance it is possible that the case of October 24th may have been due to contact with the case of October 3rd. In the home of H. F. Brant there occurred two cases dates of onset July 1st and August 10th. The case of July first was that of a child 7 years of age who was nursed by its mother who was taken ill on August 10th. It is possible that the case of August 10th was secondary. At the home of William Cole two cases occurred, dates of onset August 1st and 14th. The case of August 14th was that of Hulda Cole who acted as nurse for the case dated August 1st.

It is possible then that there were 3 secondary typhoid fever cases where the infection was due to contact and there is a little evidence to show that 4 other cases may have been due to the same cause.

Sanitary Condition and Sewage Disposal.

The sanitary condition of the borough was that of the usual mining village. The residential section on the west hill side containing the better class residences was in good sanitary condition being well sewered and most of the streets paved with brick. The residences on the slope in the eastern part of the town were in a fairly good sanitary condition. In this part streets were not paved and many of the residences were not connected with the sewer. The business section of the borough as a whole was in good sanitary condition. The buildings were all connected with the public sewer, streets paved, public water almost wholly in use and the alleys in this district were kept in a fair sanitary condition by the owners of the property adjoining.

To the north and south of the borough were the poorer residences. The greater part of these properties belong to the Pennsylvania Coal and Coke Company and were inhabited by a poor class of miners. The ground surface is flat, facilities for draining the streets were absent, surface water collecting on the surface of the ground disappeared almost wholly by percolation and evaporation. The yards and alleys were littered with refuse of almost every kind and the cellars, when existing were damp, and poorly ventilated. The section in the northern part was totally without sewers. The privies were of poor construction usually being a very shallow earthern vault. Flies had free access to the privies and surfaces water often entered and overflowed, crossing the yard and entering the street. On many of the lots were located out-buildings for the accommodation of chickens, pigs and occasionally a cow was sheltered in an improvised shed.

The Borough Board of Health decided to have an investigation made of all borough properties. One hundred and twenty properties were inspected by the local Board of Health officers and notices were served on many of these properties regarding the improvement of the sanitary condition as to cleaning or removal of privies, cleaning of yards and cellars, and in some cases it was asked that the properties be connected with the borough sewer. A majority of the notices served were on properties owned by The Pennsylvania Coal and Coke Company. The Superintendent, Mr. E. C. Brown, refused to improve the properties as desired by the local Board of Health officer. When any improvement was made by the Coal Company it was simply a temporary improvement and of little or no value. The borough residents not living in company houses refused to make the necessary improvements on their properties until the Coal Company took action. It was maintained that they should not be forced to improve the sanitary conditions of their properties unless the orders issued against the Coal Company could be enforced. Also the local Health Officer refused to further proceed with the borough inspection until the Pennsylvania Coal and Coke Company began the improvements already requested. The local Board of Health would not proceed against the Coal Company and the council would take no action. There was then little improvement except on those properties where typhoid fever was located. These properties were looked after especially by a State Health Department officer and in almost every case improvement was obtained.

The 43 typhoid fever cases were located on 34 properties. Eighteen properties on which 23 cases of typhoid fever cases were located were not connected with the sewer but used privies. Sixteen properties representing 20 typhoid fever cases were connected with the sewer. Five of the 16 properties connected with the sewer also had privies which were in use part of the time. Ten of the privies on properties where typhoid fever cases were located were found to be in good condition and needed no improvement. In these cases little was done except to use a disinfectant. Six privies were removed and the properties were connected with the sewer. Two were removed, the vaults filled and new privies built.

In five instances where bad conditions existed no action was taken whatever except that an abundance of lime was used. The Patton Clay and Tile Brick Company, whose President is also President of the Borough Council furnished lime free of charge on all properties on which typhoid fever was located. Very little was done by the Coal Company to improve the sanitary conditions of the many properties under its control.

Sewerage System.

No very accurate information could be obtained regarding the existing sewer system of the borough. Prior to 1910 H. C. Yeager and T. J. Graham were Borough Engineers. Both of these men were at the time they were employed by the borough also employed by the Pennsylvania Coal and Coke Company. They are at the present time employed by the same company. The officers taking their places in 1910 were in many ways antagonized by the former engineers. And it is claimed by the present secretary of the council that he does not have in his possession accurate information concerning the engineering work carried on by Mr. Yeager and Mr. Graham. The record of the present secretary of council concerning the existing sewers prior to 1910 are said to be such as he could obtain from files of the local newspaper and his personal knowledge of the borough as a resident. Messrs. Yeager and Graham give the following table as representing the sewer lines laid in 1906 and 1911. It is said that the total of 9,333 feet laid in 1911 was according to an ordinance passed in 1910. The record of the borough clerk shows that sewer lines were laid on the same streets designated in the following table for 1911 but does not agree as to the exact length of the sewer lines.

Sewers Laid in Patton During 1911 According to H. C. Yeager and T. J. Graham Former Borough Engineers.

Street.	Length.	Size.	Year Laid.
Mellon Avenue,	2350	10	1906
Lemwood Aveuue,	1947	6	1911
Brewer Avenue,	693	6	1911
Magee Avenue,	1068	8	1911
Palmer Avenue,	1173	8	1911
Mellon St.,	250	8	1911
Kerr Avenue,	700	8	1911
Lang Avenue,	1280	8	1911
Russell Avenue,	450	8	1911
Beach Avenue,	1772	8	1911

Mr. Yeager and Mr. Graham also plotted on a borough map, the borough sewers as they understood them to exist at the present time. According to these gentlemen there are about 23,660 feet of borough sewers having been laid according to ordinance of the Borough Council. The borough officers do not have a map showing the sewer lines. According to the sewer map the borough sewers have 5 outlets on the east side of Chest Creek and one on the west side. It is also said there are many private sewers entering into Chest Creek. Many of these are from private residences.

The Patton Clay Manufacturing Company have a 24 inch sewer line emptying into Flannigan Run. This sewer receives sanitary drainage from the manufacturing plant itself as well as a number of the company's houses. The Patton Brewing Company has a 20 inch line to Chest Creek. This also receives the sanitary drainage from about 10 company houses. The New York Silk Mill Company has a ten inch line to Chest Creek with sanitary connections.

The borough officers have at no time made application to the Department of Health for a permit for the extension of their sewer system. They have in no way recognized the existence of the State law regulating the construction and discharge of municipal sewers.

Milk Supply.

The general features of the outbreak were not those usual to an outbreak caused by milk borne infection. There were no disproportionately large number of cases among the children. But six cases were under 10 years of age and there were no cases under 5 years of age. There were but 4 milk wagons and dealers selling milk about the borough. There were no borough regulations regarding the sale of milk and licenses were not required from milk venders. W. H. Karlheim sold about 18 gallons of milk to 65 customers. The only source of supply was his own dairy. I. J. Hoover usually sold about 23 gallons of milk to 77 customers. Mr. Hoover obtained milk from L. L. Hoover, H. J. Hoover and A. C. Fox. Mr. J. W. Bender sold 17 gallons of milk to 71 customers. Mr. Bender bought milk occasionally from Squire Barnes. Mr. Frank Dietrich usually sold 16 gallons of milk to 56 customers, frequently buying milk from G. W. Baker. There had been no typhoid fever for many years in families of these four milk dealers nor in the families from which they bought milk.

The 43 cases of typhoid fever investigated obtained their milk supply from 19 sources. The number of cases supplied by each of the 19 sources is given in the following table:

The Number of Cases Supplied by Each of the Nineteen Sources of Milk Supply.

1.	W. H. Karlheim,	10
2.	J. W. Bender,	7
3.	I. W. Hoover,	7
4.	Frank Dietrich,	4
5.	Own cow,	5 (3 sources)
6.	Anthony Good,	3
7.	Mrs. J. Trinkley,	2
8.	J. Steve,	2
9.	H. Fox,	1
10.	S. Fadora,	1
11.	F. Lehman,	1
12.	Mrs. Gramy,	1
13.	S. Harly,	1
14.	D. Fadora,	1
15.	John Shreve,	1
16.	I. Farbaugh,	1
17.	J. Fox,	1

Six of the typhoid fever cases secured their milk from more than 2 sources. Among those having milk routes about the borough it will be noted that Mr. Karlheim had 10 fever cases among 65 customers, Mr. Bender 7 cases among 71 customers, Mr. Hoover 7 cases among 77 customers and Mr. Dietrich 4 cases among 56 customers. In no instance was there an excessive number of fever cases among the customers on the milk route.

But one of the 19 sources of the milk supply had typhoid fever on the premises. Martin Good, son of Anthony Good developed typhoid fever having date of onset October 4th. Mr. Good supplied milk to the following cases of typhoid fever:

Ruth Lannon, date of onset September 28th.
Clinton Cartwright, date of onset September 1st.
Clara Cartwright, date of onset October 12th.

Mr. Good did not deliver milk but his customers called at the house bringing with them their own milk vessels or borrowing them from the Good household. By this method it was either possible to carry infection to or from the premises of Mr. Good. It will be noted that 2 of the cases supplied by Mr. Good occurred prior to that of Martin Good and one shortly after. It is not at all probable that the case of October 12th could have been due to infection from the case of October 4th, but it is possible that the case of September 1st could have caused the case of October 4th.

The farms of those producing milk for sale from wagons were in excellent condition. In each case the water supply was above suspicion, the barns were in good condition and the method of handling the milk was that usually found among dairymen supplying small towns and having but few customers. Some of the premises on which 1 or 2 cows were kept and from which milk was delivered to 1 or 2 fever cases were in very bad condition and care was usually taken to improve the sanitary conditions on these properties.

From the foregoing information concerning the milk supply it is evident that the typhoid fever outbreak as a whole or even in small part could not be attributed to milk borne infection.

Public Water Supply.

The public water supply for the borough is furnished by The Patton Water Company. This company was chartered November, 1893, for the purpose of supplying water only within the borough of Patton. There is no record in the office of the Secretary of the Commonwealth showing that the charter rights have been extended; however, the water mains have been extended to supply water to several mines owned by the Pennsylvania Coal and Coke Company and miners living nearby. Also residents in the immediate vicinity of the borough are supplied by this company.

The water supply is obtained from Chest Creek within the borough limits about 500 feet from the southern boundary. At this point a small timber dam holding about 210,000 gallons diverts the water into a cistern to which the pump suction line extends.

The 44 square mile of water shed above the intake dam was inspected by the Inspection Bureau during the present year. It was found that Chest Creek received many tributaries draining a rugged and mountainous agricultural land of poor quality. Many of the streams coursed through narrow steep sided ravines and were subject to sudden fluctuations in flow.

The P. R. R. line follows Chest Creek and the S. E. branch, the entire distance of nearly 12 miles. During this distance the railroad crosses the stream or its tributaries adjacent the stream ten times. The P. R. R. line running from Bradley Junction to Cherry Tree crosses Laurel Lick Run as tributary of Chest Creek two times. Over these two railroad branches eight passenger and main freight trains pass daily.

The public highway makes 41 crossings over Chest Creek or its main tributaries.

The Department's report of sanitary survey of the watershed gives the population of the shed as 1,274. The report shows that on the shed there are 231 farms; 11 schools; 10 residents; 2 factories; 1 store and 10 other establishments. Of the 265 properties reported inspected 232 were satisfactory and 33 unsatisfactory, all but 4 of the 33 unsatisfactory properties were improved and satisfactory by December 31st, 1911. According to the report the pollutions consisted of 18 privies, 8 closets, 8 baths, 2 barnyards, 7 pig-pens, 13 kitchen waste, 14 laundry wastes, 10 slops and 1 saw dust. There were 32 abatement notices served. The inspection showed 31 cases of typhoid fever during the last 10 years.

The inspection report showed that upon the shed were 553 horses, 1,127 head of cattle and 943 pigs. The greater part of the stock were said to be running at large, many having access to the streams.

Pumping Station.

The water works pumping station is located about 75 feet from Chest Creek on the eastern bank a short distance south of the breast of the intake dam. The cistern into which the water is diverted is 6 feet square and 13 feet deep. The walls are of masonry and cement. A copper screen keeps very coarse material from the well.

Two compound duplex Worthington pumps of 500,000 gallon capacity each take the water from the cistern 60 feet distant through 2, 8 inch suction lines and force it through one 5 inch and one 6 inch main to the reservoir 1,500 feet distant and at an elevation said to be 185 feet above the pumping station. The suction lift at the pumping station varied from 5 to 10 pounds and the water pressure in the force main from 90 to 95 pounds. There is no connection so that water may be pumped from the pumping station direct to the distribution mains.

Two steam boilers are used to furnish power for the pumps which are in operation. The pumping equipment has been in service a number of years and is not operated at full capacity. According to the employees at the pumping station, flood stages in Chest Creek cause the suction well to be covered with creek water and occasionally water rises to a height of 2 feet in the boiler room causing pumping operation to be suspended.

The reservoir is located on a hill in Clearfield Township, about one-eighth mile southeast of the borough on land owned by the Pennsylvania Coal and Coke Company. The reservoir is surrounded by second growth timber. No buildings are near. The reservoir is about square in plan with sloping sides. The top comprises 7,396 square feet. When full it has a depth of 13 feet and capacity of about

525,000 gallons. The base elevation of the reservoir is given as 1,954 and is then over 190 feet above the business section of the borough. The north and east sides are of concrete one inch in thickness. These side walls were completed the present year. The south and west sides are of brick and mortar construction and are in need of repairs. These walls are reinforced by surrounding earthen embankments about 10 feet in width at the top. The inner wall extends to the surface of the embankment. On the outer edge of the surrounding embankment is a 6 foot board fence to protect the reservoir.

The distributing system covers the whole built up part of the borough. The system consists of the following mains other than the small mains for house connections:

1.08 miles 8 inch.
1.00 mile 6 inch.
3.36 miles 4 inch.
2.63 miles 3 inch.

Since 1906, 2.25 miles of 3 inch and 4 inch mains have been laid. Some of the mains are cast iron and some wood. There are 580 service taps on the system. There are 6 dead ends and 2 blow-offs on the system. Fire protection is given through 27 fire plugs showing pressure of 80 to 90 pounds under normal conditions. It is said that when the mines are drawing heavily on the supply that the pressure is so reduced that there is a scarcity of water even in the low districts. This condition has caused much complaint. The mains leading to the mines are continuation of the borough distributing system. Three inch mains lead to mines Nos. 26, 28, 33 and 39. A six inch main leads to mine No. 30 where a small reservoir is located and the water is pumped from the three inch main to mines No. 27 and No. 29. When these mines are in operation they use a large amount of water and the pressure in the distributing system in the borough is reduced Frequently the water works pumping station is shut down about midnight and by morning the water in the reservoir is nearly exhausted when the mines are in full operation.

The Flannigan Run reservoir was abandoned several years ago and it is said that it is out of repair and will never be used again.

During the investigation a map showing the distributing system was made and furnished to the Department's field officers. Upon this map was located the typhoid fever cases and the wells and springs that showed B. Coli when samples were examined at the Department's laboratory .

Extension to the borough water works has been made whenever desired. A complete record of the extensions could not be obtained. In the following table are given the extensions of the water works distributing system during the years 1908 and 1911, according to the Superintendent of the water works, Mr. R. E. Cornelius. It is not claimed by the superintendent that the table represents all of the extensions but it shows that during the present year over three thousand feet of distributing main has been laid within the borough limits. The water company has never made an application to this Department for a permit to extend or improve its water works. The officials, however, are well aware of the law requiring application to be made when extensions are desired but so far the law has been ignored.

Extensions to Water Works Distributing System According to Superintendent R. E. Cornelius.

Year.	Length.	Size.	Location.
1908	400 feet	3 inch	McIntyre Ave. W. of 5th Ave.
1911	400 feet	4 inch	Magee Ave. E., of 3rd Ave.
1911	350 feet	4 inch	Highland Ave., E. of 3rd Ave.
1911	300 feet	4 inch	3rd Ave., N. of Lang Ave.
1911	290 feet	3 inch	McIntyre Ave., E. of 3rd Ave.
1911	200 feet	3 inch	McIntyre Ave., E. of 3rd Ave.
1911	145 feet	2 inch	Lang Ave., between 6th and 7th Ave.
1911	310 feet	4 inch	West Magee Ave., to Mellon St.
1911	300 feet	2 inch	Beach Ave., between 4th and 5th Ave.
1911	450 feet	4 inch	Kerr Ave., west of 5th Ave.

On arrival in Patton October 9th the Department representatives called upon Mr. E. C. Brown, Secretary and Treasurer of the water company and represented that the Department was in possession of information leading to the belief that the public water supply of Patton was not beyond suspicion and because typhoid fever was prevalent within the borough it was the duty of the water company to do whatever was possible to place the public water works in a condition such that it could not be censured for a further spread of a water borne disease. It was suggested that the water then in the reservoir should be treated with a copper sulphate and a hypo-chlorite apparatus be installed in the pumping station to treat all water pumped from Chest Creek into the reservoir and that as soon as treated water was available the distributing system should be thoroughly flushed by opening the blow-offs, dead ends and fire plugs about the borough. It was also suggested that the local Board of Health be communicated with and that signs be placed in public places throughout the borough asking that all water water was treated with copper sulphate using 1½ parts to the million by weight. The secretary and treasurer at once gave his personal attention to the suggestion made by the Department officials. On the afternoon of October 9th the reservoir water was treated with copper sulphate using 1½ part per million by weight. The pumping station was shut down soon after the water in the reservoir was treated and a chlorite of lime apparatus was installed and put in operation when the pumping station was placed in operation the following morning. The water in Chest Creek was clear and showed but a small amount of color. Ten pounds of chlorinated lime was used to each million gallons. The lime was of a high grade being that obtained in 10 pound cans from J. W. Gilmore Bros. Drug Co., Pittsburgh. On October 11th the distributing system was thoroughly flushed under the supervision of the water company's superintendent. The dead ends on the distributing system were flushed out many times. The operator at the pumping station kept the record of the amount of chlorinated lime used each 30 minutes while the pumps were in operation. Samples were collected frequently and sent to the Department s laboratory for analysis.

The borough of Patton is located on an elevation of 1,756 feet above sea level. Many of the surrounding mountains reach an elevation of 2,000 feet and over. At this high elevation vegetation dies early in the Fall. During the early part of October when the water was being treated the water of Chest Creek was heavily laded with colloidal organic matter. This excessive amount of organic matter required oxidation by chlorinated lime before complete removal of intestinal organisms was obtained. By the use of 10 pounds of chlorinated lime it was found that there was a material reduction in the bacteria count but B. coli were occasionally present. Also at this period heavy rains were frequent. On October 25th orders were given to use 20 pounds chlorinated lime part per million gallons. This amount was continued until November 6th when freezing weather came and the stream was clear. At this time the dose of lime was reduced to 10 pounds and so continued. Samples were collected until December 7th and no B. coli were found in any samples of treated water collected on and after October 26th.

In the following table are shown all bacteriological analyses of samples from the public water supplied by the Patton Water Company. This table also shows the condition of the stream at the time the samples of the raw water were collected and the amount of lime used as an disinfectant:

Results of Bacteriological Analyses of Water Supplied by the Patton Water Company.

Date of Collection.	Raw water at pump station.		Tap at pump station.		Treated water in reservoir.		Taps about boro.		Condition of stream.	Pounds lime to a million gallons.
	Bac.	B. Coli.	Bac.	B. Coli.	Bac.	B. Coli.	Bac.	B. Coli.		
Aug. 31	320	4	......	......	240	12	120	8	High and very turbid	....
Aug. 31	......	......	......	......	......	......	150	6		
Aug. 31	......	......	......	......	......	......	300	2		
Sept. 18	240	10	......	......	160	12	60	0	High and turbid, ..	....
Sept. 18	......	......	......	......	......	......	400	5		
Sept. 18	......	......	......	......	......	......	120	12		
Oct. 4	200	8	......	......	160	5	24	0	Turbid, ...	....
Oct. 4	......	......	......	......	......	......	100	2		
Oct. 4	......	......	......	......	......	......	80	1		
Oct. 10	100	1	......	......	......	......	6	0	Clear, ...	10 lbs.
Oct. 10	80	1	16	0	......	......	24	0		
Oct. 10	......	......	10	0	......	......	200	0		
Oct. 16	30	2	40	1	......	......	30	2	Turbid, ...	10 lbs.
Oct. 16	60	2	48	3	......	......	20	0		
Oct. 16	......	......	......	......	......	......	30	0		
Oct. 16	......	......	......	......	......	......	24	0		
Oct. 16	......	......	......	......	......	......	10	0		
Oct. 16	......	......	......	......	......	......	12	0		

Results of Bacteriological Analyses of Water Supplied by the Patton Water Company.—Continued.

Date of Collection.	Raw water at pump station.		Tap at pump station.		Reservoir. (Treated water.)		Taps about boro.		Condition of stream.	Pounds lime to a million gallons.
	Bac.	B. Coli.	Bac.	B. Coli.	Bac.	B. Coli.	Bac.	B. Coli.		
Oct. 17	140	1	10	0	......	......	18	0	Clear, ...	10 lbs.
Oct. 17	......	......	20	1	......	......	4	0	Clear, ...	....
Oct. 17	......	......	......	......	......	......	24	0		
Oct. 18	1000	13	40	0	200	6	200	2	Very turbid, creek, raised 9 feet, ...	10 lbs.
Oct. 18	1200	48	......	......	......	......	160	5		
Oct. 18	......	......	......	......	......	......	250	21		
Oct. 18	......	......	......	......	......	......	24	0		
Oct. 19	60	1	12	0	......	......	40	4	Creek high, water very turbid, ...	10 lbs.
Oct. 19	180	10	16	0	......	......	60	0		
Oct. 18	......	......	......	......	......	......	70	0		
Oct. 26	14	0	10	0	20	0	8	0	Clear, ...	20 lbs.
Oct. 26	......	......	8	0	......	......	10	0		
Oct. 26	......	......	......	......	......	......	6	0		
Oct. 26	......	......	......	......	......	......	20	0		
Oct. 30	4	0	8	0	......	......	6	0	Clear, creek frozen over, ...	20 lbs.
Oct. 30	60	0	6	0	......	......	8	0		
Oct. 30	......	......	......	......	......	......	480	0		
Nov. 6	10	0	4	0	10	0	......	......	Clear, creek frozen over, ...	10 lbs.
Nov. 6	18	0	6	0	......	......	......	......		
Nov. 9	20	0	16	0	8	0	10	0	Clear, creek frozen over, ...	10 lbs.
Nov. 9	40	0	10	0	......	......	8	0		
Nov. 14	24	1	12	0	......	......	8	0	Ice melted, creek turbid, ...	10 lbs.
Nov. 14	14	0	......	......	......	......	......	......		
Nov. 27	3	0	......	......	......	......	......	......	Clear, creek frozen over, ...	10 lbs.
Nov. 27	2	0	......	......	......	......	......	......		
Dec. 6	10	0	......	......	......	......	......	......	Clear, creek frozen over, ...	10 lbs.
Dec. 7	6	0	......	......	2	0	6	0		
Dec. 7	6	0	......	......	......	......	4	0	Clear, creek frozen over, ...	10 lbs.
Dec. 7	......	......	......	......	......	......	4	0		
Dec. 7	......	......	......	......	......	......	6	0		
Dec. 7	......	......	......	......	......	......	2	0		
Dec. 7	......	......	......	......	......	......	1	0		

In the following table is shown the water supply of the 43 typhoid fever cases investigated during the 30 days prior to the date of infection:

40 of the 43 typhoid fever cases used public water supply.
17 used public water only.
6 used public supply and many springs at mines.
3 used public supply and Wheatland (Biller) well.
2 used public supply and Cartwright well.
2 used public supply and Nelson well.
2 used public supply and Whoomer spring.
1 used public supply and Garlarda, Dietrick and Nelson wells.
1 used public supply and Rowland well and mine spring.
1 used public supply and Whoomer spring, Trenkle well and others.
1 used public supply and Whoomer spring, Trenkle well.
1 used public supply and Trenkle well.
1 used public supply and Hoffer spring.
1 used public supply and Johnstown public supply.
1 used public supply and various springs and wells.
2 used from Brant well only.
1 used from Seka well only.

From the preceding table it will be noticed that 40 of 43 typhoid fever cases used the public water supply for drinking purposes. Seventeen used only the public water supply. Six cases used the public water supply and also obtained water from numerous springs at the various mines where they were working. These springs were many and it was impossible to locate any one that was in particular use as the miners drank from the many outcropping springs near the works. Three cases obtained water from what is known as the Wheatland well, located on the Beller property. The bacteriological examination from this well showed it to be free from B. coli and the total count was very low. This well was in a good location and properly protected. The two cases in the Cartwright family used water that was obtained from a well on their property. As soon as the first case developed the doctor, suspicious of the well water, had the well filled and abandoned. Three cases obtained water from the Nelson well. The first sample collected from this well showed the presence of B. coli but upon improvement by disinfecting, the second sample showed no B. coli. Two cases obtained water from the Whoomer spring. This spring was used by over 20 families during the summer and but two cases of fever developed among those using this water. The first sample collected showed the presence of B. coli but after the spring was improved so as to prevent the entrance of surface drainage the second sample showed the absence of B. coli. The 8 other cases using the public water supply used as many different individual supplies. The 2 cases occurring in the Brant family used the water only from the well on their property. The case in the Sheka household is said to have used water only from the well located on their property.

While it is possible that some of the individual water supplies may have contributed in some small extent to the typhoid infection it is impossible that they could have had any great effect or have been the cause of more than 2 or 3 cases. The 43 fever cases investigated occurred between July 1st and October 25th inclusive. This is not a large number in a population of 3,976. The proportion is that usually found in outbreaks due to water borne infection of a mild character. It is probable that in this case the infection was mild and occurring intermittently, possibly entering with surface drainage whenever there was a heavy rain fall.

Individual Water Supply.

There were located within the borough 136 dug wells, 3 drilled wells and 7 springs. All wells and springs used by typhoid fever patients and those that appeared suspicious from general conditions were sampled and the sample collected was analyzed at the Department's laboratory. When results showed the presence of large number of Bacteria or the presence of B. coli there were efforts made to have the spring closed or to have improvements made. If improvements were made a second sample was taken to show whether or not the supply was then satisfactory. Forty-two wells and 5 springs were sampled. Twenty-five showed low total count and no B. coli when first sampled. Thirteen showed the presence of B. coli in the first sampling but after improvement was made and then disinfected the second sample showed the absence of B. coli. Five wells were closed and abandoned. Two showed the presence of B. coli in the first sample and as no action was taken by the owners and the well was not used by any typhoid fever cases no further action was taken. Two showed the presence of B. coli in the first sample and also in the second sample after being disinfected and improved. In these two cases further improvement was requested but a third sample was not collected.

In the following table is given the name and source of the individual supply and the number showing the location on the map giving the distributing system and the public supply, the dates on which samples were collected, the bacteriological results and brief notes regarding the action taken, if any.

LOCATION AND RESULTS OF ANALYSES OF INDIVIDUAL WATER SUPPLIES.

Name.	Map of location.	Source.	Date of collection.	Bacteria per c. c.	B. Coli per c. c.	Notes.
Cole Brothers, ...	49	Dug well	Sept. 18	5250	400	Pump removed and well closed.
E. M. Smail, ...	40	Dug well	Sept. 18	2000	240	Pump removed and well closed.
Michael Trinkley, ...	42	Dug well	Sept. 18	300	60	Sick, will clean well and disinfect.
Howard Whoomer, ...	30	Spring	Sept. 18	20	1	Ditch made to carry surface water from spring.
Howard Whoomer, ...	30	Spring	Oct. 30	20	0	

LOCATION AND RESULTS OF ANALYSES OF INDIVIDUAL WATER SUPPLIES—Continued.

Name.	Map of location.	Source.	Date of collection.	Bacteria per c. c.	B. Coli per c. c.	Notes.
Adolph Hoffer, ...	41	Spring	Sept. 19	200	21	Tile sunk to protect spring but surface water still enters.
Adolph Hoffer, ...	41	Spring	Dec. 6	8	1	
William Sodula, ...	7	Dug well	Oct. 10	400	36	Well not used; put in city water.
Andy Jolly, ...	8	Dug well	Oct. 10	40	2	Well cleaned and limed.
Andy Jolly, ...	8	Dug well	Nov. 27	4	0	
Marks Mill, ...	10	Dug well	Oct. 10	60	0	
Paul Biller, ...	9	Dug well	Oct. 10	12	0	
Paul Biller, ...	9	Dug well	Nov. 14	10	0	
Joe Pryzogoda, ...	1	Dug well	Oct. 10	6	0	
Joe Pryzogoda, ...	1	Dug well	Nov. 14	6	0	
Mike Macarto, ...	2	Dug well	Oct. 10	60	8	Well closed, protected and limed.
Mike Macarto, ...	2	Dug well	Nov. 27	3	0	
Peter Somnick, ...	3	Dug well	Oct. 10	560	0	
W. Myers, ...	4	Dug well	Oct. 10	80	5	Well cleaned, protected and limed.
W. Meyers, ...	4	Dug well	Nov. 27	160	0	
Mike Nongola, ...	6	Dug well	Oct. 10	800	0	
Chas. Swaphopsky, ...	5	Dug well	Oct. 10	100	8	Well cleaned, protected and limed.
Chas. Swapkopsky, ...	5	Dug well	Nov. 27	8	0	
Lewis Bloomburg, ...	16	Dug well	Oct. 16	80	2	Protected and limed.
Lewis Bloomburg, ...	16	Dug well	Nov. 27	10	0	
Martin Thomas, ...	17	Dug well	Oct. 16	48	0	
Water Company at pumping station, ...	19	Spring	Oct. 16	20	0	
William Gill, ...	11	Dug well	Oct. 16	8	0	
George Bott, ...	12	Dug well	Oct. 16	36	0	
Bart Young, ...	13	Dug well	Oct. 16	0	0	
M. A. Dietrick, ...	14	Dug well	Oct. 16	600	48	Not in use, will close.
John Galarda, ...	15	Dug well	Oct. 16	100	8	Protected and limed.
John Galarda, ...	15	Dug well	Nov. 27	400	0	
E. A. Miles, ...	18	Dug well	Oct. 18	12	0	
Robert Nelson, ...	20	Dug well	Oct. 18	12	0	Protected and limed.
Robert Nelson, ...	21	Dug well	Dec. 6	1	0	
Cole Brothers, ...	21	Dug well	Oct. 18	18	0	
Richard Rowland, ...	22	Dug well	Oct. 18	300	1	Limed.
Richard Rowland, ...	22	Dug well	Nov. 27	80	0	
Ellen Cathenaw, ...	23	Dug well	Oct. 19	16	1	Nothing done; tenant and refused. Unable to see owner.
Mike Pranck, ...	24	Dug well	Oct. 19	120	0	
Ed. Thomas, ...	25	Dug well	Oct. 19	140	0	
Victor Lower, ...	26	Dug well	Oct. 26	10	0	
Steve Jacobs, ...	27	Dug well	Oct. 26	100	1	Limed.
Steve Jacobs, ...	27	Dug well	Dec. 6	12	0	
C. Heist, ...	28	Dug well	Oct. 26	4	0	
Charles Bender, ...	29	Dug well	Oct. 26	60	0	
Joe Karlheim, ...	33	Dug well	Oct. 30	40	0	
Joe Lewis, ...	34	Dug well	Oct. 30	50	0	
George Zeroz, ...	31	Dug well	Oct. 30	30	0	
Anthony Conkusky, ...	32	Dug well	Oct. 30	210	1	Well closed; put in city water.
Martin Undara, ...	35	Dug well	Nov. 9	80	5	Used lime treatment.
Martin Undara, ...	35	Dug well	Dec. 6	16	1	
Elliott Rhodes, ...	36	Dug well	Nov. 9	60	8	Protected and limed.
Elliott Rhodes, ...	36	Dug well	Dec. 6	10	0	
Frank Ballou, ...	37	Dug well	Nov. 9	120	12	Protected and limed.
Frank Ballou, ...	37	Dug well	Dec. 6	3	0	
Philip Link, ...	38	Dug well	Nov. 9	20	0	
J. Litzinger, ...	39	Dug well	Nov. 9	100	1	Protected and limed.
J. Litzinger, ...	39	Dug well	Dec. 6	4	0	
H. F. Brant, ...	44	Dug well	Nov. 27	16	0	
Gust Lindbloome, ...	45	Spring	Dec. 6	30	0	
Thomas Shean, ...	46	Spring	Dec. 7	6	0	
S. A. Nelson, ...	47	Dug well	Dec. 7	3	0	

Discussion.

After consideration of the possible sources of infection and the character of the outbreak it is possible that of the 43 cases 2 may have been due to contact, 1 to infected milk and 2 to infected individual water supplies. The general infection could only come in one of two ways. First, individual water supplies; second, public water supply. Had the individual water supply been the general source a large number of wells and springs must have been infected at the same time and the 17 cases declaring that they received during the 30 days prior their date of onset no water except from the public supply must have obtained water from several infected individual supplies.

The water shed of Chest Creek from which the public water supply is derived covers a mountainous area of 44 square miles and has 1,274 inhabitants. The intake dam from which the pumping station draws water is small and prevents any sedimentation period. The reservoir holds scarcely a day's supply when the mines are in operation. Sudden rain falls on the water shed are quickly removed to the stream giving turbid water. This water is within a few hours delivered to the consumer within the borough. In this way infectious material on the water shed would be quickly transferred to the consumer. It is probable that the infection causing the outbreak under discussion was transferred in this way. There is no means provided by the water company to prevent such an infection. Had the infection been entering the public water supply intermittently this source was probably eradicated by disinfecting of the water with chlorinated lime as no cases occurred after the infection period had terminated after the use of chlorinated lime was installed. Whether or not the public water supply was the cause of the present outbreak, it certainly is possible that an outbreak could occur in this way.

The water company has been making extensions to their distributing system recently without obeying the law that private water companies should obtain permission from the Commissioner of Health before making extensions.

The borough officials have recently extended the public sewer system in violation of the act requiring a permit from the Commissioner of Health. The borough officials will be asked to show reasons why this law has been violated. The sanitary condition of the borough could be greatly improved by the connection to the municipal sewer of the houses owned by the Coal Company and Clay Company. An intercepting sewer should be built to carry the sewage now discharged at five different points in the borough limits to a point below the built up portion of the borough. The existing private sewers should be connected with the municipal sewers.

The local Board of Health has not been working in unison with the physicians of the borough and the records submitted to the Department of Health concerning the existence of contagious diseases within the borough have not been true to local conditions. Some steps should be taken to obtain more accurate records. These matters will receive the attention of the Department during the ensuing year.

32. TYPHOID FEVER AT SOUTH BETHLEHEM.

During the autumn of 1911 typhoid fever broke out in South Bethlehem Borough, Northampton County. At that time Assistant Engineer Ennis was on the ground making an investigation of the filter plant and water works system of the Bethlehem City Water Company of South Bethlehem. He had occasion to consult the typhoid records at the City Board of Health and to his astonishment discovered the existence of an incipient epidemic which up to that time had received no attention from the local authorities. All told before the Department got through there were one hundred and thirty-one (131) cases.

In the following pages the report of general conditions and the Department's operations so far as the Engineering Division is concerned, will be found.

Chlorinated Lime Treatment.

On April 30th, 1907, the Bethlehem City Water Company of South Bethlehem, Northampton County, Pennsylvania, made the following application for permission to construct a new water works pumping station:

"We are about ready to start building operation for a new pumping station, which will be located 3,700 feet west of our present pumping station and along the tracks of the Lehigh Valley Railroad Company. The water will be drawn from the Lehigh River the same as we are now doing. The reason for our changing the location is that we are on leased ground from the Lehigh Valley Railroad Company. The said Railroad Company is making great changes which will necessitate the removal of our pumping station."

The pumping station was in course of construction at the time the application was made and it was completed the same year. The Commissioner of Health took no action on the application because it was too late to make any modification that might be thought desirable by the Department.

On October 19th, 1911, the same company made application for permission to install chemical apparatus to disinfect the water. This application was as follows:

"We hereby make application for the installation in our pumping station at South Bethlehem, Pa., of a permanent automatic machine to feed solution of hypochlorite of lime into the suction well before the water enters the pump. We desire to use the hypo-chlorite during the time when the water in the river is turbid caused by heavy rainstorms, etc.

"We would appreciate it very much if the permit be granted at an early date as the party who received the contract for the machine is ready to install it."

This application was made during the prevalence of a typhoid fever outbreak in South Bethlehem Borough. The officers of the Department were on the ground and had installed a temporary hypo-chlorite plant at the pumping station. It was for the purpose of substituting a permanent plant for this temporary one that application was made. In view of the circumstances, however, the company did not wait for formal approval but made the substitution while the Department's representatives were on the ground.

This hypo-chlorite of lime feeding plant was installed by the Roberts Filter Manufacturing Company under a contract. The apparatus consists of two wooden solution tanks 4 feet in diameter and 4 feet high, each equipped with an agitator driven by a pair of cast iron bevel gears, which revolve at a slow rate of speed, and at all times maintain a finely divided solution, also a wooden float tube to which is attached a wooden gauge board graduated into two scales on the face; one scale for determining the depth of solution in the tank in tenth parts of a foot and the other for determining the fall in tenth parts of a foot. The indicator is connected by a wooden rod to a spherical glass float travelling in the float tube.

A cast iron cylindrical mixing tank 16 inches in diameter by 26 inches in height between flanges, mounted upon a cast iron base with cast iron removable cover is placed on the solution tanks. The mixing tank is equipped with an agitator made of round steel rods which revolve at a slow rate of speed, driven by a pair of cast iron bevel gears and with fresh water inlet connections, outlet connections and blow-off.

A cast iron enamel lined orifice feeding tank, mounted upon a cast iron base with all necessary inlet, outlet and blow-off connections, balance valve, calibrated feeding orifice and electric alarm is provided into which the solution from the larger tanks flows to be fed to the water.

A line shaft with necessary wall brackets, pulleys and belting for driving the agitators in the mixing and solution tanks is also provided.

The power to operate the agitators in the mixing and solution tanks is supplied by water motor operating under a head of over 100 pounds pressure. The description of the operation of the plant accompanying the application is as follows:

"The hypo-chlorite of lime is placed in the cast iron mixing tank through the hinged cover on the top, fresh water supply valve opened and power transmitted to the agitator. After a sufficient quantity of water (fresh) has been supplied to the hypo-chlorite of lime for dissolving purposes, the fresh water supply valve is closed and the material agitated until the bulk of the hypo-chlorite of lime has become dissolved. The agitator is then stopped, the fresh water supply and outlet valves opened and the pressure of water allowed to flush the hypo solution into the solution tank until the mixing tank has discharged the solution into the solution tank. The outlet valve is closed and the blow-off valve opened, allowing the residue in the mixing tank to be carried off to the drain. The fresh water supply valve to the solution tank is then opened and sufficient quantity of water admitted to form a solution of the strength required to properly treat the water; then the valve is closed cutting off the supply of fresh water. The agitator in the solution tank is then started in motion by shifting the belt from the line shaft from the loose to the tight pulley, and the solution is agitated while being fed. The outlet valve from the solution tank is then opened and the solution admitted to the orifice feeding tank through a balanced valve actuated by a spherical glass float which keeps the solution in the above tank at a constant level. The orifice valve is calibrated and the dial graduated into hundredths parts of a square inch and the pointer set opposite the proper size opening on the dial to give the desired quantity of discharge. The solution passes from the orifice valve into an open funnel which permits of a sight feed by which the operator can readily see the solution as it is discharged from the orifice feed tank. It is conveyed through wrought iron pipe from the funnel to the water company's existing raw water pump suction well, and is fed to the water as it passes into the pump suction. From the gauge board on the solution tank the operator can readily determine the quantity of solution being fed, and when the solution has been allowed to feed until there remains but about 2 inches in the bottom of the solution tank, the agitator is stopped by shifting the belt to the loose pulley. The outlet valve closed and the blow-off valve opened allowing the dregs to pass off to the drain. Before the outlet valve on the solution tank has been closed the outlet valve on the companion solution tank is opened permitting of a continuous supply of solution which has been prepared in the companion solution tank being fed to the orifice feed tank. The orifice feed tank is provided with an electric alarm to notify the operator when the solution has stopped feeding."

"The electric alarm consists of a metal cap swung from a hook attached to an electric contact held in position with a spiral spring. The solution discharged from the orifice feeding valve flows into the metal cup until it is filled when it spills over the sides into the funnel. The weight of the solution in the cup compresses the spring, breaking the electric contact. If for any reason the solution is not being properly fed, the cup empties itself of the solution, becomes lighter, the spring expands, drawing the cup into the position assumed when not in operation. The contact is formed completing the electric circuit which rings a bell that may be located at the operator's most convenient point of employment that he may be notified immediately that the solution is not being fed."

The apparatus was stated to be capable of feeding the required amount of solution for the treatment of eight million gallons of water in 24 hours.

At the present time this plant at the pumping station is used for the introduction of alum solutions to the water to promote coagulation and sedimentation in the basin on the hill before the water is delivered to the filters.

A similar apparatus has been set up in the filter house and hypo-chlorite of lime solution is applied to the filtered water gallery before the water enters the storage basin outside the building.

Charter Territory.

The State Hospital for the Insane at Rittersville is to be supplied with water by the Bethlehem City Water Company. To understand the water district in which the Bethlehem City Water Company has rights to supply the public with water, it is essential to briefly describe the location of the townships and municipalities in the district.

South Bethlehem is located on the south bank of the Lehigh River and adjoining it to the west is the Borough of Fountain Hill and to the east the borough of Northampton Heights. The latter place and South Bethlehem are in Lower Saucon Township. Fountain Hill is in Salisbury Township which extends westerly along the river as far as the city of Allentown.

Opposite South Bethlehem on the north bank of the river is the borough of Bethlehem made up of old Bethlehem Borough that was incorporated out of Bethlehem Township, and to the west West Bethlehem Borough incorporated out of Hanover Township. The latter extends westerly far beyond Allentown along the river and in it are located the Rittersville hospital and the settlement known as East Allentown. All these places except Allentown are supplied with water by the Bethlehem City Water Company.

In 1864, the Bethlehem South Gas and Water Company was chartered by an act of the Legislature to supply water in the village of South Bethlehem and others adjoining in Saucon, Salisbury and Hanover Townships in the counties of Northampton and Lehigh, Hanover and Salisbury being in Lehigh County.

In 1893, the Mountain Water Company was chartered to supply the public with water in the township of Bethlehem. In April of the same year these two water companies were consolidated under the name of Bethlehem Consolidated Water Company, the latter sold its franchises and properties to the Bethlehem City Water Company in December 1903, this company having been chartered in September 1903, to supply the public in Bethlehem Township.

The population of the various districts in the Water Company's territory is as follows:

South Bethlehem,	19,973
Fountain Hill Borough,	1,388
Northampton Heights Borough,	1,037
West Bethlehem Borough,	4,000
Hanover Township (including 1,000 in Rittersville and 1,000 in East Allentown),	3,500
Bethlehem Township,	3,100
Lower Saucon Township ,	4,200
Salisbury Township,	4,583
	41,781

Existing Water Works.

The Bethlehem South Gas and Water Company built works in 1865, the source being the Lehigh River. The Mountain Water Company built works in 1893, utilizing for the purpose a spring on the top of the mountain back of Lehigh University. In 1904 a water filtration plant was installed. At the present time the system comprises a pumping station in Salisbury Township on the South Bank of the Lehigh River about one mile up stream from South Bethlehem. The inlet to the pump well is a screened chamber in the bottom of which there are copious springs. There is an additional spring located on the hillside above the station, enclosed in masonry and water from which is piped to the station and pump well. The land is wooded and uninhabited and owned by the water company. It is estimated that during much of the year 75 per cent. of the water supplied by the water company to the public is obtained from these springs, but during droughts the river has to be drawn upon almost exclusively.

There are two pumping engines of seven and ten million gallons pumping capacity in 24 hours. Water is raised through a 16 inch force main with a vertical height of 265 feet and a total length of 5,700 feet to a subsidence and storage basin on the hill. The pumps are usually operated 18 hours each day. During bad stages of the river the very turbid waters are permitted to pass, pumping operations being temporarily suspended. During last year the average daily pumpage has been 3.5 million gallons.

The storage basins and filter plant are located in Fountain Hill Borough. The subsidence basin is of earth embankment construction on three sides and in excavation on the other side. In plan it is 420 feet long, 220 feet wide and 21 feet deep. The overflow line is elevation 256 feet above the upper part of South Bethlehem.

The force main enters the basin at one end and the opposite end is the gate house through which the water passes to the filter plant. The capacity of the reservoir is said to be 14 million gallons. The raw water may be by-passed around this basin and filter plant to the gravity main extending to town. Water also after subsidence may be by-passed to the filter plant and be delivered into the filtered water basin. Water cannot be pumped directly into the filter plants or filtered water basin. The filtered water basin adjoins the sedimentation basin and it is of earth construction 280 feet long, 170 feet wide on the average and has a depth of 17 feet holding a capacity of 5 million gallons, the overflow line is 20 feet lower than that in the subsidence basin. A 20 inch pipe line and a 16 inch pipe line deliver the water to the consumers in the district. The distributing system consists of 52 miles of pipe ranging from 4 to 22 inches in diameter. Bethlehem has its own water supply, but that part of it formerly West Bethlehem is furnished by the water company. There are two 12 inch pipe lines extending under the Lehigh River into West Bethlehem. From one of these an 8 inch line about three miles long extends westward through the village of Rittersville to the village of East Allentown where it terminates in a steel standpipe having a capacity of about half a million gallons. The elevation of the water in this standpipe fluctuates considerably owing to the draft for consumption purposes. At Rittersville there is a branch line about 1,500 feet long extending up the hill to the Homeopathic State Hospital. Water here is delivered into a pumping basin from whence it is raised into a storage reservoir built and maintained by the institution located on the hill. The pump well is large enough to operate to some extent as an equalizing basin and it is placed at sufficient low elevation to assure a supply of water at all times so it is calculated.

The filtration plant is located adjacent to the subsidence and clear water basins.

Filtration Plant.

No preliminary treatment other than subsidence without chemicals has ever been attempted prior to the time of the Department's investigation of 1911. Since that time as hereinbefore stated, it is reported that coagulants have been applied at the pumping station. The filter house is a brick building 205 feet long, 106 feet wide. It contains 6 scrubber or preliminary filters and 6 open slow sand filters, the complement of the preliminary filters. Across the entire width of the building 106 feet, is the inlet chamber 3 feet wide by 8 feet deep covered with a wooden floor. A 20 inch pipe delivers the water from the sedimentation basin into this chamber. From this inlet there is an 8 inch pipe extending to each of the 6 scrubbers or preliminary filters. Each preliminary filter is 16 feet wide by 38 feet long, terminating in a suctional wall over which the water flows into the corresponding secondary filter. Each of these secondary filters is 189 feet long by 16 feet wide by 6 feet deep. So it appears that the primary and secondary filters are built in parallel rows, the corresponding units always being operated in unison.

Each scrubber is drained by a concrete covered channel connecting to the sewer which discharges outside into a line going down the hillside. The inlet pipes are laid on the bottom and water rises up from them through the filtering material, having a total depth of 58 inches, consisting of river gravel, coke and an 18 inch layer of sponge. The material is prevented from floating by a wooden grillage extending across the scrubbers and securely held in place. The flow of the water from the surface of the scrubbers is longitudinally over the dividing wall on to the sand filters. The normal water level in the scrubbers is about 12 inches above the dividing wall, equivalent to about 2 feet 4 inches above the sand in the sand filters.

The scrubbers are washed by opening the valve on the 12 inch flushing drain and permitting preliminarily treated water to pass downward through the filtering material. Each unit is washed in this manner once every other day and twice each year the sponges are removed and washed in a rotary washing machine set up on the wooden platform above the preliminary filters. The combined filtering area of the scrubbers is 3,648 square feet and when running at the usual capacity are operated at the rate of from 40 to 42 million gallons to the acre and day, It is reported that the preliminary filters have a bacterial efficiency to from 65 to 75 per cent.

The sand filters are of concrete construction similar to the scrubbers. Longitudinally at the botom of each filter is a concrete collecting drain which delivers the effluent through an 8 inch cast iron pipe into the effluent chamber at the opposite end of the building from the inlet chamber. The filtering material consists of 18 inches of river gravel from three inches to one-quarter inch in diameter supporting 26 inches of filtering sand. The combined area of the filters is one-third of an acre and when the plant is operated at its usual capacity three and a third million gallons in 24 hours, the rate is a little less than ten million gallons an acre daily. In the effluent gallery there is a loss of head gauges provided for each filter unit. It is possible by throttling the 8 inch valves on the outlet pipes of each sand filter and by throttling the inlet valves to regulate the work performed by each filter.

There are no meters installed for recording or measuring the rate or amount of water delivered to the filter plants or passed from each filter unit.

The effluent chamber is 5 feet wide by 7 feet deep and extends the entire width of the building. From the effluent chamber water flows through a 20 inch pipe to the filtered water basin. The pipe gallery is underneath the floor formed by the cover of the effluent chamber and the operating stands are set up on the floor. Each filter discharges into the effluent chamber direct, but a by-pass connection is provided and by manipulating the valves from the standards on the operating platform any unit may filter to waste through a 6 inch sewer line which discharges outside of the filter building.

Prior to January of 1911 the filters were cleaned by removing and washing the top layers of sand. After cleaning the beds were sterilized with permanganate of potassium; also at times with copper sulphate. It is reported that no chemicals have been used in the past year. There is no coagulant used at the plant.

The average minimum run of the filters between cleanings in the past 9 months was about three weeks and the maximum run was from 4 to 6 weeks.

An attendant is constantly on duty at the plant and the filter plant is operated continuously. During the past year an average of 3.25 million gallons of water was filtered daily. The capacity of the plant is rated at 4,000,000 gallons for 24 hours. The filters were built by the Maignen Filter Company of Philadelphia.

It is in this effluent gallery that the filtered water is now being treated by hypochlorites of lime.

Spring Water Supply.

The works of the old Mountain Water Company consist of a storage reservoir and gravity supply main. The source of supply is from springs located on the mountain side near Seidersville village, Lower Saucon Township, at a point about two miles south of South Bethlehem. The drainage area above the springs is partly wooded land, largely under cultivation. There are numerous farmsteads on the water shed and the population will probably exceed 50 inhabitants. The nearest building to the spring is 600 feet distant.

The springs are enclosed in a loose masonry structure, built below the ground surface and provided with a loose wooden cover. Surface water may enter the spring enclosures and they are not protected from chance or malicious pollution. From the spring encolsures a 6 inch pipe 1,000 feet long extends to a storage reservoir and a branch 6 inch main about 2 miles long extends along the old Philadelphia Road to the Lehigh University. Along the pipe line in the southwestern extremity of South Bethlehem there are 12 dwellings attached.

The storage reservoir is of masonry construction 80 feet long, 50 feet wide and 12 feet deep, having a capacity of about 300,000 gallons. Surface water may enter the reservoir and it is not enclosed by a fence.

The Lehigh University has a system of pipes extending throughout the grounds. Water is purchased from the Bethlehem City Water Company for both domestic and fire purposes. The drinking water is pumped from the end of the water company's line by a centrifugal pump which discharges into a force main leading to two covered wooden tanks located on the University property. The tanks have a capacity of 15,000 gallons each and have an elevation somewhat higher than the water company's reservoir. From the tanks water flows by gravity to one dormitory building and two fraternity houses located on the grounds. The water for fire protection is obtained from springs, the source of supply of the old Mountain Water Company. There is no connection between the two systems, so it is reported, but this report is doubted.

Efficiency of the Filter Plants.

During April, 1909, the State Department of Health made a test of the efficiency of the filter plant. In 12 samples of filtered water no B. coli were found to be present and the total count was low with one exception. Out of six samples of water after passing through the scrubbers one only contained B. Coli, but two out of four samples collected from the subsidence reservoir showed the presence of sewage organisms. The University's President has made arrangement with the water company whereby analyses are made at least every month of the raw and filtered water at four places (of the raw water at one place and of the filtered water at three places) and reports are made to the University.

Examining these records for the years 1910 and 1911 up to October, it appears that B. Coli were present in the water of the subsidence basin in 25 out of 26 samples analyzed and in the filtered water in 11 out of 105 samples.

The State Department of Health made a second test of the filter plant beginning September 19th, 1911, lasting for two weeks. The summary of these tests is as follows:

Out of 11 samples of river water, well water and reservoir water, there were found present B. Coli in 8 river samples, 8 well samples and 7 reservoir samples. Of 13 samples of water passed through the scrubbers 6 contained sewage organisms, and of 42 samples of water after passing through the filters, but 4 contained sewage organisms in one c. c. During the same two weeks' period the Department collected from taps about town 115 samples of which 14 contained B. Coli.

Typhoid Fever Outbreak.

During the efficiency test of the water filter plant on September 22nd, Mr. Ennis, Assistant Engineer of the Department, in charge of the tests, went to the Board of Health office in South Bethlehem to look over the typhoid fever records. He noted that during the month of August two cases only of typhoid fever were reported in South Bethlehem, but he also noted with surprise that from September 1 to September 22nd, 35 cases of typhoid fever were reported. This alarming condition was called to the attention of the local health officials. They were advised to notify the public to boil all milk and water and to canvass the situation to ascertain the cause of the outbreak. The cases were largely in the eastern section where foreigners were employed in the steel works and reside in crowded tenements.

The public water at this time was apparently well purified and the raw water from the Lehigh River contains very low counts of sewage organisms so that suspicion was directed away from the public supply. On September 26th the borough requested assistance from the State Department of Health in running down the origin of the outbreak and of directing perventative measures. Inspectors Miller, Hellings, Silliman, Haines and Styer, under Mr. Ennis, on the 27th of September began a systematic canvass of all of the cases reported and of the sanitary conditions at the properties on which the cases occurred. On Sunday, October 1st, Dr. Hunt and the Department nurses arrived at South Bethlehem to take up their work with the local Board of Health.

The Bethlehem Steel Company's private spring water supply appeared to be of suspicious origin as the water came from a spring in the limestone at the foot of the hillside upon which the foreign population lived in the crowded tenements. The sewage from these buildings was discharged into limestone crevices. Therefore, a temporary hypo-chlorite of lime treatment of the spring water at the steel plant was installed on Monday, October 2nd. It was later concluded that this spring water was the medium of transmission which caused the outbreak.

August was a rainy month. On the 18th there was a precipitation of 1.4 inches. From the 24th through to the end of August it rained continuously, there being a down pour on the 31st of 2.03 inches. In South Bethlehem there were 9 cases of typhoid fever during August, but during September there were 67 cases, most of them having their onsets during the middle third of the month. The rains washed the pollutions from the limestone crevices on the hillside into the spring at the Bethlehem Steel Company works, through underground passages as proved by serial tests of the spring water. These tests are given in the following table:

Tests of Raw Spring and Tap Water Collected at Bethlehem Steel Company Works by the Department of Health.

Date of Sample Collection.	Bacteria per c. c.			Remarks.
		B. Coli.		
	Total.	Spring.	Taps in works.	
1912:				
September 19,	....	0	0	
September 20,	....	0	0	
September 21,	80	1	1	
September 25,	100	0	0	
September 26,	84	0	1	
September 28,	100	1	0	
October 1,	480	0	0	Heavy rains.
October 2,	2400	60	36	
October 2,	3000	48	....	
October 3,	300	24	0	Hypo plant in operation.
October 4,	300	8	0	
October 5,	450	4	0	
October 10,	300	1	0	
October 11,	1000	1	0	
October 12,	400	1	0	
October 17,	160	0	0	
October 24,	70	0	0	
October 25,	36	1	0	
October 26,	80	0	0	

It will be noted that the water of the spring and samples collected from the taps about the works did not show much sewage pollution during the last week of September but on the first day of October there was a heavy rain and the following five days there was a marked sewage contamination of the raw spring water, particularly on October 2nd and then falling off until a week later the quality of the water was normal again. This sudden contamination proves the connection existing between the limestone fissures on the hillside and the Steel Company's spring. The Department on October 3rd had set up and begun to use a sterilizing plant for the spring water. On that day and subsequent to it, the treated water was free from sewage organisms as shown by the tests. This prompt action undoubtedly saved the public from a severe and extended outbreak of typhoid fever.

The records of typhoid fever cases as reported to the State Department of Health by the South Bethlehem authorities for the years 1908-1911 inclusive, appear in the following table:

Typhoid Fever Cases Reported by Borough.

	1908	1909	1910	1911
January,	7	3	3	3
February,	2	1	4	1
March,	8	5	3	1
April,	2	5	1	2
May,	3	0	1	2
June,	1	0	1	0
July,	3	2	3	1
August,	19	1	11	2
September,	3	1	12	51
October,	3	2	12	17
November,	2	3	11	9
December,	0	2	3	6
Totals,	53	25	65	95

For 1906 there were 13 cases and for 1907, 38 cases It is known that not all of the cases occurring were reported. For instance in the year 1911, there were 113 cases for the year, or 18 more than reported to Harrisburg by South Bethlehem Borough. While these cases are not abnormally high, they are greater in number than in many municipialities furnished with pure water and maintaining a high standard of municipal sanitation.

In the followng table the number of typhoid fever cases in South Bethlehem for the year is given by months. The cases for July, August, September and October were investigated by the Department and are known to be correct.

Cases of Typhoid Fever in South Bethlehem for the Year 1911.

January,	3		
February,	1		
March,	1		
April,	2		
May,	2		
June,	0		
July,	1	Onset looked up	83 cases looked up
August,	9	Onset looked up	
September,	67	Onset looked up	
October,	12	Onset looked up	
November,	9		
December,	6		
Total,	113		

For October, however, six of the 12 cases only had their onsets looked up, making for the four months 83 cases whose onsets were canvassed by agents of the State Department of Health. Besides these cases there were others existing in the surrounding boroughs and townships. Some of these patients were employed at the Steel Mill and drank the spring water. Others were employed in Bethlehem Borough where there was a typhoid fever outbreak at the same time, due to Bethlehem's polluted water. and in the following table is given for months of August, September and October, all typhoid fever cases occurring in surrounding boroughs and four townships from which it will appear that 19 of these outside cases were attributed to the use of the polluted spring at the Steel Company plant, 10 were attributed to the polluted Bethlehem Borough water and 19 were of miscellaneous origin.

Cases of Typhoid Feven in August, September and October Due to Various Causes as Noted.

	Source of Infection.			
	Steel Company Spring.	Bethlehem Borough water.	Miscellaneous.	Total cases for 3 months.
Fountain Hill borough,	1	0	1	2
Northampton Heights borough,	5	0	0	5
W. Bethlehem, (part of Bethlehem Borough),	0	1	0	1
Catasauqua Borough,	1	0	0	1
Nazareth Borough,	0	2	0	2
Freemansburg Borough,	3	0	1	4
Hanover Township,	1	1	8	10
Salisbury Township,	0	0	1	1
Lower Saucon Township,	5	1	2	8
Bethlehem Township,	3	5	6	14
Totals,	19	10	19	48

In connection with the South Bethlehem outbreak there were 131 cases of typhoid fever investigated for the months of August, September and October. Eighty-three of these cases were of foreigners living in South Bethlehem. Forty-eight lived in the surrounding boroughs and townships, Bethlehem excluded. The progress of the outbreak is shown in the following table by weeks and proves that in the middle week in September the height of the epidemic was reached:

Cases Investigated in South Bethlehem and Surrounding Boroughs and Townships Excluding Bethlehem Borough.

	In South Bethlehem.	Outside Territory.	Total.
First week ending August 7th,	2	0	2
Second week ending August 14,	0	1	1
Third week ending August 21,	2	2	4
Fourth week ending August 28,	6	2	8
Fifth week ending September 4,	7	2	9
Sixth week ending September 11,	16	11	27
Seventh week ending September 18,	27	15	42
Eighth week ending September 25,	15	7	22
Ninth week ending October 2,	2	4	6
Tenth week ending October 9,	3	2	5
Eleventh week ending October 16,	2	1	3
Twelfth week ending October 23,	1	1	2
	83	48	131

Summarizing the 131 cases as to origin of the infection, the conclusions reached by the Department were that 84 cases were due to the spring at the Bethlehem Steel Company plant, 14 were due to polluted Bethlehem borough water, 19 were of miscellaneous origin in places outside of South Bethlehem and 14 were sporadic cases in South Bethlehem, making a total of 93 cases originating in South Bethlehem, and 33 cases originating outside of South Bethlehem.

The Department's officers rendered valuable assistance to the local health inspectors of South Bethlehem in their efforts to correct the unsanitary conditions existing in the borough. Altogether 1,824 properties were inspected. Of this number 377 were unsatisfactory. Ninety verbal notices covering 120 properties and 144 legal notices covering 257 properties were served. Of this number 342 properties have been cleaned up and put in a sanitary condition. There were 184 privies cleaned and disinfected, many of the highways and alleys were cleaned and altogether the borough underwent a thorough cleaning. The night soil was taken to nearby townships where it was deposited on farmland and plowed under.

Conclusions.

The Lehigh River above the water company's intake receives sewage from Allentown and a succession of communities along the Lehigh River. It also receives considerable acid mine and drainage washery wastes from the anthracite coal fields. Mine water has a germicidal effect on sewage organisms which no doubt counts for the comparatively low total bacterial content of the raw water at times as shown by the numerous bacteriological examinations made. This fact coupled with a long subsidence period afforded in the water company's reservoir very likely contributes largely to the usually good quality of water served to consumers.

The filter plant is operated ordinarily at its maximum capacity under ordinary conditions and in excess when a filter unit is out of service for repairs or when the condition of the river water is particularly bad. Additional units at the filter plant are needed. Rate controllers should be installed at the filters to ascure their being operated at a rate of speed calculated to deliver water pure and wholesome at all times. A larger wash water pump is needed, capable of delivering sufficient water to thoroughly agitate and clean the sand layer of the filters and the collecting system on the bottom of the sand filters should be improved principally to assure equitable distribution of the water during the reverse current and cleaning period. Cleansing methods for the scrubbers should be improved. A bacteriological laboratory should be equipped at the plant and daily bacteriological examinations of the water in its various stages of purification should be made on the grounds, simple chemical tests should be made daily of the raw water and used as a basis for determining the amount of chemical coagulations to be applied to the raw water.

Hypo-chlorite dosing apparatus as well as the entire water purification plant should be under the supervision of the bacteriologist who should be placed in charge under the direction of the general superintendent of the water works system.

No raw water nor partially treated water should be pumped into the gravity supply mains of the town and the existing by-pass connection around the filter plant between the force main and the gravity supply main and between the sedimentation reservoir and the supply main should be closed and sealed and never be used except in a case of emergency when the local and State health officials should be notified.

The spring supply of the Old Mountain Water Company should be protected with a substantial masonry structure extending above the ground surface to exclude surface water. It should be provided with a cover and kept locked. All surface water should be excluded from the distributing reservoir and man and beast should be kept out by means of a fenced enclosure.

These various matters are being considered with the Water Company and the Department will require that the water works be controlled on substantially these conditions and stipulations.

33. TYPHOID FEVER AT TARENTUM.

On October 12th, 1911, Assistant Engineer Ralph E. Irwin, in company with Dr. C. J. Hunt, Associate Chief Medical Inspector of the Department went to Tarentum Borough, Allegheny County to make an investigation regarding the prevalence of typhoid fever in that place. Mr. Irwin conducted an inspection of the water supply and installed a temporary sterilization plant. The following is a brief report of the Department's operations concerning the water works system:

Existing Water Works System.

The Allegheny Valley Water Company, incorporated in April 1906, in August of that same year obtained the property and franchises of the Tarentum Water Company that by merger comprised the Harrison Township Water Company and the East Deer Township Water Company. The Allegheny Valley Water Company also controls the Springdale Township Water Company and Harmar Township Water Company and now operates the water works system that is supplying water to the public in Tarentum and Brackenridge boroughs in the village of Natrona and in the townships surrounding the said boroughs.

Tarentum is located on the west bank of the Allegheny River. Brackenridge is adjacent to, and up-stream from Tarentum. The water works system comprises a filtering crib in the river, intake well, pumping plant, force main, filtration plant storage basin and the gravity supply main. The intake, pumping station, filter plant and storage reservoir are located in the borough of Brackenridge. The filter plant was installed in conformity with a decree issued by the Commissioner of Health to the Tarentum Water Company on September 6th, 1907. The works have a capacity of 3,000,000 gallons for 24 hours. The Department has conducted tests of the filters and they are operated in an efficient manner. The filtration plant was put in operation about June 1st, 1908. The Department made a canvass of typhoid fever in the water districts prior to the installation of the water filter plant. The record of cases for the thirty months prior to the turning on of filtered water to the district compared with that for the first thirty months after filtered water was so supplied, showed a reduction of 90 per cent. that is, in the district for the thirty months before the filter installation there were 612 cases, and during the thirty months succeeding the installation there were 66 cases only in the water district.

Bull Creek divides the borough of Tarentum into a north and south district. This drains a large rural population and its waters are contaminated with sewage. The citizens are drinking the sewage waters of the Allegheny River, they are polluted from the village of Natrona, Harrison Township that lies within the district supplied by the Allegheny Valley Water Company.

The Department has endeavored to bring about a disposal of sewage at Natrona, Brackenridge and Tarentum in such a manner as not to endanger the purity of the filtered water supply. The introduction of raw river water into the Company's pipe system during the summer of 1911, resulted in a typhoid fever epidemic in the water district. The sewage of Brackenridge and Tarentum contributed to the contamination of the water. In the permit of September, 1907, to the Allegheny Valley Water Company, then the Tarentum Water Company, it was stipulated that certain things must be done as follows:

"The introduction of raw river water into the street main system or anywhere except into the filter plant, is absolutely prohibited. There being duplicate pumps and force mains and facilities for storing one and-half million gallons of filtered water, necessity does not exist for an emergency connection between the pumps and the street mains. To the contrary, the interests of the public health demand that all connections with the force mains between the pumps and the filter plant, shall be absolutely cut off and plugged up permanently, so this is made a special stipulation."

Typhoid Fever Out-Break of 1911.

The filter plant was put in operation June. 1908. In the water district comprising Tarentum and Brackenridge boroughs, Harrison Township and East Deer Township, there were for the remainder of that year 3 cases of typhoid fever reported. Twenty-two for the next year, 41 for that following, and 118 for the year 1911. The cases by months for this district are given in the following table:

Typhoid Fever Cases.

	1908	1909	1910	1911
January,	....	0	0	4
February,	....	0	1	11
March,	....	3	0	4
April,	....	1	4	2
May,	....	3	0	2
June,	0	1	3	0
July,	2	2	6	2
August,	0	4	10	17
September,	0	2	1	49
October,	1	2	3	14
November,	0	1	5	10
December,	0	3	8	3
Total,	3	22	41	118

It will be noted that during the months of August, September and October extending into November, sixty-nine of the cases were in Tarentum, 19 in Brackenridge, 6 in East Deer Township and one in Harrison Township. All were supplied with public water. The distribution of these cases is shown in the following table:

1911.	July.	August.	September.	October.	November.	December.	Total.
Tarentum,	1	15	35	11	5	2	69
Brackenridge,	1	2	9	1	5	1	19
East Deer Township,	0	0	4	2	0	0	6
Harrison Township,	0	0	1	0	0	0	1
Total,	2	17	49	14	10	3	95

For a more critical examination of the onsets of the cases reference may be had to the following table. The Department was not aware of the epidemic until a third of October was past when an investigation was made and a sterilization plant was set up. It appears that the water company delivered unfiltered river water and Bull Creek water into the pipe system during July and August.

Typhoid Fever Cases, 1911.

	July.	August.	September.	October.	November.	December.
1,	....	4	6	2	1	....
2,	....	....	1	1	....	....
3,	....	2	1	1	....	....
4,	....	....	....	1	....	1
5,	....	2	....	....	3	....
6,	....	1	....	....	....	....
7,	....	....	1	1	....	....
8,	....	....	....	....	1	....
9,	....	....	2	....	....	....
10,	....	....	1	....	1	....
11,	....	....	1	....	....	....
12,	....	....	1	1	....	....
13,	....	....	....	....	....	....
14,	....	....	1	....	1	1
15,	1	1	4	....	....	....
16,	....	....	1	1	1	....
17,	....	....	2	....	....	....
18,	....	....	....	....	1	....
19,	....	....	1	2	....	....
20,	....	4	5	....	....	....
21,	....	1	3	....	....	....
22,	....	1	5	1	1	....
23,	....	....	....	....	....	....
24,	....	....	....	....	....	....
25,	1	1	1	....	....	1
26,	....	....	3	....	....	....
27,	....	....	2	1	....	....
28,	....	....	5	1	....	....
29,	....	....	1	....	....	....
30,	....	....	1	....	....	....
31,	....	....	....	1	....	....
Total,	2	17	49	14	10	3

The Pittsburgh Plate Glass Company have a connection with the water works system at two of their plants in Tarentum borough. One is on Bull Creek and the other is along the river. On 9 days in July water was pumped from the river into the water works system at the river plant of the Pittsburgh Plate Glass Company. This water is not considered fit to drink. Employees are forbidden to make such use of the water and are provided with drinking water. The water company seems to have some arrangement with the Glass Company for the connection is not a new one. In the following table are given the days and the hours when the Glass Company pumped river water into the Tarentum Water Company's system according to the Glass Company records.

	Hours.
July 8,	5
July 9 and 10, total,	30
July 12,	6
July 18,	4½
July 20,	4
July 22,	3½
July 26 and 27, total,	32
August 3,	8
August 6,	12
August 7,	24
August 8,	18
August 22,	8
September 10,	8

The Bull Creek plant pumps raw creek water. During July this pump furnished water to the water company system during 282 hours. In August a better record was kept.

	Hours.
August 1,	5
August 2,	6
August 3,	11
August 5,	6
August 6,	24
August 7,	8

The creek water receives the sewage from many sources in the town of Tarentum and is totally unfit for a drinking supply. The water company requested the Glass Company to supply the water and it did so knowing that the public would receive for drinking purposes a water that is prohibited for such use among the Glass Company employees. The Tarentum Water Company or its successor did not notify the Commissioner of Health of the use of the Bull Creek and river water. The decree issued by the Commissioner of Health on September 6th, 1907, to the Tarentum Water Company specified among other things that the introduction of raw water into the street main system is absolutely prohibited. The hypo plant was installed on October 18th.

The borough of Tarentum is now considering the installation of a municipal water works plant. Voters have authorized a $100,000 bond issue for this purpose.

VI. REFERENCES TO SPECIAL COUNSEL.

During the year 1911, ninety-seven cases were referred to Department Attorneys in twenty-four counties of the State, by officers of the Department, at the direction of Dr. Dixon, where they were unable to secure abatements after repeated interviews with the owners or occupants of the properties.

In addition to writing a letter in each case, to the owner or occupant, calling his attention to the complaint of the Department and to the law governing the case, and suggesting the advisability of complying with the request of the Department, that he might save himself from the trouble and expense of a magistrate's hearing, counsel for the Department in most instances made a personal inspection, and had an interview. When the owner persisted in his refusal to abate after letter and interview, prosecutions were promptly begun in all cases where the evidence of pollution was sufficient to justify such procedure.

The primary object of the proceedings has been to secure permanent abatements. For this reason, the owner or occupant was given the opportunity of disposing of his case at any stage of the proceedings by making a permanent abatement and paying the costs.

Thirty-four of the cases were closed during the year, sixty-three cases remaining open January first, 1912.

Thirty-five cases referred before January first, 1911, were closed during the year.

In general, the year's work has been noteworthy on account of the small percentage of cases actually returned to court for trial.

A table of cases by counties follows:

County.	Attorney.	Cases referred previous to 1911. Closed in 1911.	Cases referred 1911.	Cases referred 1911. Closed 1911.	Cases referred 1911. Pending January 1, 1912.
Armstrong,	Samuel Cochran,	0	1	1	0
Beaver,	Clyde Holt,	0	1	1	0
Berks,	Williams and Sinkler,	3	25	7	18
Bradford,	B. F. Kuykendall, Jr.,	0	3	0	3
Butler,	J. M. Greer,	0	1	1	0
Cambria,	R. M. Murphey,	9	5	3	2
Carbon,	Fred Bertolette,	0	16	0	16
Centre,	Henry C. Quigley,	0	4	4	0
Chester,	Williams and Sinkler,	1	10	5	5
Delaware,	Williams and Sinkler,	0	2	1	1
Fayette,	A. E. Jones,	0	1	1	0
Lackawanna,	E. C. Ammerman,	1	0	0	0
Lancaster,	Coyle and Keller,	1	1	0	1
Lawrence,	R. K. Aikens,	0	1	1	0
Lebanon,	W. G. Light,	1	1	1	0
Lehigh,	J. L. Marsteller,	7	4	2	2
Mercer,	James M. Campbell,	0	4	1	3
Mifflin,	Rufus Elder,	0	4	2	2
Montgomery,	Williams and Sinkler,	1	0	0	0
Northampton,	Maxwell and Kirkpatrick,	0	1	0	1

County.	Attorney.	Cases referred previous to 1911. Closed in 1911.	Cases referred 1911.	Cases referred 1911. Closed 1911.	Cases referred 1911. Pending January 1, 1912.
Northumberland,	J. M. Clement,	0	1	1	0
Somerset,	E. O. Kooser,	0	1	1	0
Tioga,	Merrick and Young,	0	1	0	1
Union,	F. E. Bower,	0	2	0	2
Venango,	John L. Nesbit,	1	0	0	0
Washington,	Hughes and Hughes,	1	1	1	0
Westmoreland,	J. A. McCurdy,	1	0	0	0
York,	George H. Kain or Henry C. Niles,	8	6	0	6
	Total,	35	97	34	63

Two cases previously closed during 1910, were reopened in 1911, owing to subsequent evidence of pollution, and were pending at the end of the year 1911. Both cases were in Berks county.

Special attention is called to the cases of the Commonwealth versus East Washington Borough, Washington County, the Commonwealth versus John Bollinger and the Commonwealth versus Benjamin Sheffer, Levi Sheffer, etc.

CASES REFERRED PREVIOUS TO 1911, CLOSED 1911.

BERKS COUNTY.

The case of the Penn Trust Company, guardian for Helen Peacock, North Heidelberg Township. Pollution of a tributary to the Schuylkill River. Reported closed without litigation after inspection by counsel, July 29th, 1911.

The case of Calvin Young, Cumru Township. Pollution of Schuylkill River. Was taken before Magistrate Weber at Reading. Case discontinued December 8th, 1911, as defendant had made a satisfactory abatement and paid the costs.

The case of A. W. Stitzel, Perry Township. Stream pollution. Was carried before Alderman Weber at Reading. As the defendant had made an abatement, the case was discontinued upon payment of the costs.

CAMBRIA COUNTY.

The case of Adam Keefer, Upper Yoder Township. Stream pollution. Was reported closed without litigation.

The case of James W. Hunt, Upper Yoder Township. Stream pollution. Was reported closed without litigation during the year.

The case of W. V. Schaefer, Upper Yoder Township. Stream pollution. Was reported closed during the year without litigation.

The case of Joseph Makin, Upper Yoder Township. Stream pollution. Reported closed without litigation during the year.

The case of Arch Rose, Jackson Township. Stream pollution. Reported closed without litigation.

The case of Isaac Rose. Jackson Township. Stream pollution. Reported closed without litigation.

The case of Zachariah Varner, Jackson Township. Stream pollution. Reported closed without litigation.

The case of Walter Mackoll, Jackson Township. Stream pollution. Reported closed without litigation.

CHESTER COUNTY.

The case of Daniel J. Voorhees, Schuylkill Township. Nuisance, Reported closed May 15th, 1911, without litigation.

LACKAWANNA COUNTY.

The case of George Clark, South Abington Township. Pollution of a supply to the city of Scranton. Was reported closed March 1st, 1911, without litigation.

LANCASTER COUNTY.

The case of Charles H. Brobst, Lititz Borough. Pollution of Conestoga Creek. Was reported closed April 29th, 1911, without litigation.

LEBANON COUNTY.

The case of John Bollinger, Jackson Township. Pollution of Tulpehocken Creek by slaughter house wastes. Was referred during 1910, and as a result of the magistrate's hearing, what was believed to be a permanent abatement was secured, and the case was discontinued April 15th, 1911. Within a short time, however, an Inspector of the Department found that wastes from the slaughter house were again being discharged into the stream, thus operating the plant in practically the same manner as before criminal proceedings had been instituted. A second warrant was accordingly issued, and at the hearing on July 27th, 1911, before Alderman Seigrist, at Lebanon, the defendant was bound over to September term of court. On August 23rd, 1911, an appeal from the order of the Commissioner of Health was taken by the defendant to the Court of Common Pleas. At the time of the trial on the appeal, counsel for the Department contended that in view of the fact that the pollution had not existed prior to the passage of the Act of 1905, the order of the Commissioner was in effect only a notice to the defendant from which no appeal would lie. The court sustained this contention, and held that this was sufficient ground, in itself, on which to dismiss the appeal; it further held that as to the merits of the case, the evidence fully established that slaughter house wastes are sewage as defined by the Act of April 22nd, 1905, and as such, it was proper for the Commissioner of Health to order their discharge into a water course to be discontinued, and therefore, the opinion of the Commissioner should be sustained. While the proceedings are still pending on the criminal charge in the Quarter Sessions Court of Lebanon County, at the close of the year negotiations were pending for its settlement by the construction of a disposal system of a permanent nature.

LEHIGH COUNTY.

The case of A. O. Kisner, Upper Saucon Township. Pollution of Saucon Creek. Reported closed February 27th, 1911, without litigation.

The case of Cyperion Kressley, Lowell Township. Pollution of stream. Was taken before Magistrate Renninger at Allentown. Withdrawn April 1st, 1911, as defendant had made a satisfactory abatement, and paid the costs.

The case of Jere Peter, Lowell Township. Pollution of stream. Hearing before Magistrate Renninger at Allentown. Withdrawn during the year as defendant had made a satisfactory abatement and paid the costs.

The case of William Newhard, North Whitehall Township. Pollution of stream. Reported closed April 7th, 1911, without litigation.

The case of R. M. Cooper, Coopersburg Borough. Pollution of Saucon Creek. Was reported closed November 30th, 1911, without litigation.

The case of H. P. Hoffman, North Whiteball Township. Pollution of Lehigh River. Was nolle prossed April 15th, 1911, upon payment of magistrate's costs, owing to the removal of defendant from the property.

The case of John Wetherold, North Whitehall Township. Pollution of Lehigh River. Was carried before Magistrate W. L. Jones, at Allentown, and was discontinued December 9th, 1911, as an abatement had been made, and the costs paid by the defendant.

MONTGOMERY COUNTY.

The case of J. N. Yocum, Springfield Township. Nuisance. Was reported closed February 2nd, 1911, without litigation.

VENANGO COUNTY.

The case of John Phillips, Cornplanter Township. Nuisance. Was reported closed July 11th, 1911, without litigation.

WASHINGTON COUNTY.

The case of East Washington Borough. Pollution of stream by improper operation of sewage disposal plant. Was closed June 14th, 1911. The litigation referred to in the 1910 report, led to an agreement being entered into by the boroughs of East Washington and Washington, whereby, for a money consideration, the Borough of Washington would permit East Washington Borough to connect their sewers with the Washington Borough system, which is taken care of by a modern disposal plant. This agreement was ratified at an election held on June 14th, 1911, at which time the Borough of East Washington voted affirmatively for the issuance of $25,000 in bonds to defray the expense of the change. The disposal plant of East Washington Borough has been dismantled, and their sewers have been connected with the sewers of Washington Borough

WESTMORELAND COUNTY.

The case of L. Steele, Allegheny Township. Nuisance. Was reported closed April 21st, 1911, without litigation.

YORK COUNTY.

The case of Benjamin F. Sheffer, Levi F. Sheffer, The Glen Rock Stamping Company, J. M. Grove, L. C. Grove and I. F. Grove, Glen Rock Borough, was referred June 8th, 1909. The charge was the pollution of Codorus Creek by privies. Information was made September 24th, 1909, defendants waived hearing and entered bail for their appearance at the next term of court. The grand jury returned a true bill on October 20th, 1909. An appeal was immediately taken by defendants from the order of the Commissioner of Health. Judge Wanner, of York County, dismissed the exception taken to the return of the order of the Commissioner of Health, March 21st, 1910. Testimony was then taken on the civil suits before Judge Wanner October 22nd, 1910. Upon January 12th, 1911. Judge Wanner entered a decision sustaining the order of the Commissioner of Health, dismissing the appeal at the costs of the appellants. Exceptions were granted to defendants on January 15th, 1911. Certiorari to the Superior Court of Pennsylvania from the Court of Common Pleas for York County, February 15th, 1911. Number 23, March Term, 1911, Superior Court of Pennsylvania. An opinion filed April 17th, 1911, by Judge Orlady, a copy of which follows, upheld the lower court. In July, 1911, the Supreme Court of Pennsylvania refused to hear an appeal from the judgment of the Superior Court, and the civil cases were accordingly closed by the payment of the costs by the defendants. The criminal cases, which were pending the outcome of the civil cases, were set for trial August 28th, 1911, at which times the defendants pleaded guilty, and upon the payment of the costs, and a fine of $75 each, in the case of each defendant, the cases were closed as an abatement had been made some time previous to this date.

No. 265.

Samuel G. Dixon, Commissioner of Health. vs. **Benjamin F. Sheffer, Levi F. Sheffer, The Glen Rock Stamping Company, F. M. Grove, L. C. Grove and I. F. Grove.**	No. 23, March Term, 1911. Appeal by the defendants from the judgment of the Court of Common Pleas of York County.

ORLADY, J.

On July 23, 1909, the appellants in this case were severally served with a written notice issued by Dr. Samuel G. Dixon, Commissioner of Health of this Commonwealth, stating that in his opinion the discharge of sewage and the drainage of privies into the waters of a branch of Codorus Creek in the borough of Glen Rock, York County, from a building owned, occupied and used, as a factory or place for work by the appellants, "is now injurious to the public health, and that after an examination of the building and premises, he finds and adjudges that the privies so maintained and used are a nuisance, and nuisances, detrimental to the public health," and each of the appellants was thereby ordered to abate and remove the same, and to discontinue the discharge of sewage, etc., within ten days, and not to permit the same to flow into said waters, in accordance with the provisions of the Acts of April 22nd, 1905, P. L. 250, and April 27th, 1905, P. L. 312.

The authority for, and the effect to be given to such a notice, is found in two acts of our Legislature enacted in 1905, which are to be construed together as relating to the same subject matter, and as integral parts of a new and comprehensive system for protecting the general public health of the Commonwealth from such reckless disregard of public duty as is shown by this record. On several occasions within the past quarter century there have been in this State dangerous and fatal epidemics of disease which resulted in a great loss of life and which were directly traced to causes having their inception in similar conditions to those existing at the appellants' operation on Codorus Creek.

By the Act of April 27, 1905, P. L. 312, (eighth section), an act entitled "An Act creating a Department of Health, and defining its powers and duties," it is made "the duty of the Commissioner of Health to protect the health of the people of the State, to determine and employ the most efficient and practical means for the prevention and suppression of disease;" and by the ninth section it is provided that he "shall have power and authority to order nuisances, detrimental to the public health, or the causes of disease and mortality, to be abated and removed, and to enforce quarantine regulations."

The Act of April 22nd, 1905, P. L. 260, is entitled, "An Act to preserve the purity of the waters of the State for the protection of the public health," and by the fourth section it is declared that "no person, corporation, or municipality shall place or permit to be placed, or discharge, or permit to flow into any of the waters of the State any sewage, except as hereinafter provided .... For the purpose of this Act, sewage shall be defined as any substance that contains any of the waste products or excrementations or discharges from the bodies of human beings or animals." The ninth section declares that "Every individual, private corporation or company shall discontinue the discharge of sewage into any of the waters of the

State, within ten days after being so ordered by the Commissioner of Health." And section eleven provides that "any order or decision, under this Act, ... shall be subject to an appeal to any Court of Common Pleas of the County wherein the outlet of such sewer or sewer system, otherwise prohibited by this Act, is situated; and said Court shall have power to hear said appeal, and may affirm or set aside said order or decree, or modify the same, or otherwise fix the terms upon which permission may be granted."

The constitutionality of the Act of April 22nd, 1905, was determined after a full consideration of the subject in Commonwealth versus Emmers, 33 Pa. Superior Ct. 151, and the opinion of this Court as written by Judge Porter was affirmed by the Supreme Court 221 Pa. 298, in which case it was held that, "the privilege of discharging obnoxious sewerage into the waters of the State is a matter of public concern, and it is within the police power of the State to declare that this privilege is one which ought not to be exercised by private individuals, but only by the State or its governmental agents, acting under the direct control of the State."

The contention of the appellants that Commonwealth versus Yost, 197 Pa. 171, controls this case is without merit. That case was decided by the Supreme Court July 11, 1900, five years prior to the enactment under which this proceedings is founded. It was there held that "If the public have a right to receive pure water through the agency of a corporation legally authorized to take it from the stream, he who pollutes it offends against the public. If on the other hand the water of a stream, in which riparian owners alone have an interest, be polluted, the wrong or injury is a private one, for which the indivual or individuals injured may have redress; and this is true whether the riparian owner be a private person or a water company which does not take the water from the stream under the right of eminent domain." And under the facts of that case (it being an indictment for maintaining a common nuisance), the court held "The wrong done by the defendant, if any, was to such riparian owner, the York Water Company, in depriving it of the use of pure water for ordinary domestic purposes, and any wrong committed was a private one, for whcih the remedy was purely civil."

The facts in this case are radically different. It was shown on this trial, in such a way that it must be considered as regularly in evidence, that as early as February 8th, 1816 (6 Smiths Laws, 319), the York Water Company was incorporated, and authorized to take water from this stream, and by a further supplement to that act, dated April 11th, 1840, P. L. 340, the York Water Company was authorized to proceed to bring into the Borough of York" such additional supply of water as they shall deem sufficient, from such spring or springs, stream or streams as they may select," etc., etc.

True it is that these are private Acts of Assembly, and judicial notice is not ordinarily to be taken of them. However, in this case they were not only well known to the Court and counsel, but they were used by the counsel on both sides of the argument of the case in the court below, and they are incorporated in the ninth finding of fact by the Trial Judge. With such acquiescence by appellants without any objection to such use it is now too late to say that they are not regularly on this record.

Two of the appellants are the owners of a three-story manufacturing plant, which is regularly occupied by 130 to 150 employees at least; toilet closets are provided for the use of employees on each floor, from all of which sewage and human excrement have from time to time been discharged into the stream, with the knowledge and under the management of the owners and tenants of the premises, and were being so discharged at the time of the issuance of the notice to the appellants to discontinue such pollution.

The court finds as a fact, and upon abundant proof, that the discharge of such sewage from this property into the stream had previously polluted it, and was still polluting it to such an extent that it had become dangerous, and was likely to become injurious to the public health at the Borough of Glen Rock and at the City of York; and further, that the discharge of said sewage by the appellants was likely to produce typhoid fever, dysentery, diarrhea, and other diseases amongst parties using the water for drinking and other domestic purposes, and was likely to spread typhoid fever amongst parties coming into contact with the contaminated water.

These findings of fact and the direful results likely to follow such pollution, are not challenged, nor is it denied that such pestilential and contagious diseases are in fact developed and transmitted by just such practices as are charged against these defendants. This therefore is not a question of private injury, but of a grave public wrong. The case does not turn on the question whether the York Water Company is incorporated or not, or whether a riparian owner is injuriously affected, but it is to be considered in the light of a beneficient legislation which has been so wisely administered by a Department of our State government: Commonwealth versus Ashley Borough, 37 Pa. Superior Ct. 354. The preservation and protection of the public health is one of first duties of civilized society, and the Department of Health has been given very elastic powers to conserve the purposes of its creation. The Commissioner of Health after a careful examination of the premises, decided that this factory, as maintained and used by the owners and occupants, was a continual menace to the public health. The testimony fully demonstrates the correctness of his conclusions, and the notices given to each and all the parties connected with this public nuisance were served upon the appellants severally. They took a joint appeal to the Court of Common Pleas and after a full hearing the judgment of the Commissioner was properly vindicated.

The same parties sued out their joint appeal to this court, as if they were jointly concerned in the offence. If they were separately affected by the decree they should have taken separate appeals. They cannot on a single appeal although taken by them jointly, procure a review of the judgment of the court below upon their individual cases: Samson's estate, 22 Pa. Superior Ct. 93; May's estate, 22 Pa. Superior Ct. 79; Commonwealth vs. Surety Company, 37 Pa. Superior Ct. 167. As no motion was made to quash the appeal for this reason, we prefer to dispose of the question involved on its merits.

It is a mistake to say that the Commissioner of Health has no power to order the discontinuance of an admitted pollution of this stream of water or to contend that the public has no rights therein. The first section of the Act of April 22, 1905, declares that "the term 'Waters' wherever used in this act shall include all springs and streams, and all bodies of surface and of ground waters, whether natural or artificial, within the boundaries of the State."

Codorus Creek is larger in its vent of water than some of our streams that are called "Rivers" and it flows through a thickly populated section of the State, and from it a large community secures all the water used for domestic purposes.

The regulation of the practice of a summary proceeding, by notice from the Commissioner of Health, and an appeal to the Common Pleas was clearly within the authority given by the constitution of the State to the Legislature in exercising its powers over all subjects on which legislation was not prohibited: Sharpless vs. Mayor, 21 Pa. 147; Commonwealth vs. Bell, 145 Pa. 347; Keller vs. Scranton, 200 Pa. 130.

The case was carefully tried and the undisputed facts found by the court exhibit a flagrant disregard of public rights on the part of such of the appellants as have control over the pollution of this stream. The notice and order were regular and were founded upon sufficient cause. The assignments of error are over-ruled and the judgment is affirmed.

Opinion filed April 17, 1911.

The case of John Smith Shrewsbury Township. Pollution of the stream supplying the Borough of Glen Rock. Was carried before the Grand Jury on January 3, 1911. Grand Jury found a true bill. Case continued until the October Term of Quarter Sessions. Jury returned a verdict on October 16, 1911, not guilty, costs placed on York County.

The case of Paul E. Sell, Hanover Borough. Pollution of Forney's Run. Was closed August 3, 1911, without litigation.

The case of E. Harry Kirk, Hanover Borough. Pollution of Forney's Run. Was closed August 3, 1911, without litigation.

The case F. J. Kolarik, Hanover Borough. Pollution of Forney's Run. Was closed August 3, 1911, without litigation.

The case of Harry P. Yutz, Hanover Borough. Pollution of Forney's Run. Was closed August 3, 1911, without litigation.

The case of J. W. Gitt & Company, Hanover Borough. Pollution of Forney's Run. Was closed without litigation, August 3, 1911.

The case of George B. Gitt, Hanover Borough. Pollution of Forney's Run. Was closed without litigation, August 3, 1911.

CASES CLOSED DURING 1910, REOPENED 1911.

BERKS COUNTY.

The case of Francis K. Stamm, North Heidelberg Township, pollution of Schuylkill River, was reopened May 5, 1911, owing to subsequent pollution. Hearing was held before Magistrate Weber at Reading, and the defendant was bound over to the Quarter Sessions Court. Case pending at end of year; partial abatement made.

The case of Israel Shappell, Perry Township, pollution of Schuylkill River, was reopened May 6, 1911, owing to subsequent pollution, and remained open at the end of the year.

THE STATUS OF EACH CASE REFERRED DURING 1911 FOLLOWS.

ARMSTRONG COUNTY.

The case of John Soltesz, Gilpin Township, nuisance from filthy hog pens, was referred September 7, 1911, and reported closed October 12, 1911, without litigation.

BEAVER COUNTY.

The case of T. J. Rouser, North Sewickley Township, pollution of Connoquenessing Creek, was referred March 29, 1911, and reported closed without litigation December 2, 1911.

BERKS COUNTY.

The case of Peter Ruth, North Heidelberg Township, pollution of Tulpehocken Creek, was referred March 4, 1911. Information was made by Officer Nightingale before Magistrate Weber at Reading, and at the hearing on September 14th, 1911, defendant pleaded guilty and was held for appearance at the next term of court. Case pending at the end of the year.

The case of Jacob R. Meck, Bethel Township, pollution of Schuylkill River, was referred March 4, 1911, and reported closed August 7, 1911, without litigation.

The case of Benjamin F. Greenawalt, Windsor Township, pollution of Schuylkill River, was referred March 27, 1911, and was reported closed May 6, 1911, without litigation.

The case of Edward Muthard, Colebrookdale Township, pollution of Schuylkill River, was referred April 6, 1911, and was pending at the end of the year.

The case of George Weidner, Pike Township, pollution of Schuylkill River, was referred April 6, 1911. Information was made before Alderman Weber at Reading September 13, 1911, and the defendant was bound over to the December, 1911 Term of court. This case was withdrawn December 8th, 1911, as defendant had made a satisfactory abatement and paid the costs.

The case of Robert Gift, Earl Township, pollution of Schuylkill River, was referred April 6, 1911. Information was made before Alderman Weber at Reading and at the hearing on June 2, 1911, defendant was bound over to the next term of Court. Case was withdrawn June 19, 1911, as defendant had made an abatement and paid the costs in full.

The case of Milton Boeshore, Tulpehocken Township, pollution of Schuylkill River, was referred April 6, 1911, and remained open at the end of the year.

The case of Elias Messner, Brecknock Township, pollution of Schuylkill River, was referred May 5th, 1911, and reported closed May 27. 1911, without litigation.

The case of H. R. Quigley, Washington Township, pollution of Schuylkill River, was referred May 5, 1911, and was pending at the end of the year.

The case of Elmer Troutman, Tulpehocken Township, pollution of Schuylkill River, was referred June 27, 1911, and remained open at the end of the year.

The case of the Orphanage of Saint Francis, Cumru Township, pollution of Angelica Creek, a supply to the Angelica Water Company, was referred June 22, 1911, and reported closed June 27, 1911, without litigation.

The case of Adam Delp, Upper Alsace Township, pollution of Antietam Creek, a supply to the City of Reading, was referred September 1, 1911. Information was made before Alderman Weber at Reading and at the hearing on September 14, 1911, the defendant was bound over for appearance at the December Term of Court. The case was withdrawn December 8th, 1911, as the defendant had made an abatement and paid the costs.

The case of Lee Rosenberger, Colebrookdale Township, pollution of Ironstone Creek, was referred September 22, 1911, and was pending at the end of the year.

The case of Milton Stertzel, Upper Tulpehocken Township, pollution of Schuylkill River, was referred December 4, 1911, and remained open at the end of the year.

The case of David Strunk, Jefferson Township, pollution of Schuylkill River, was referred November 3, 1911, and remained open at the end of the year.

The case of Irwin Lesher, Upper Bern Township, pollution of Schuylkill River, was referred November 3, 1911, and was pending at the end of the year.

The case of Jacob F. Epting, Upper Bern Township, pollution of Schuylkill River, was referred November 3, 1911, and remained open at the end of the year.

The case of Mrs. Emanuel Blatt, Jefferson Township, pollution of Plum Creek, was referred November 3, 1911, and remained open at the end of the year.

The case of George Weber, Tulpehocken Township, pollution of Schuylkill River, was referred November 3, 1911, and was pending at the end of the year.

The case of Henry Christ, Penn Township, pollution of Schuylkill River, was referred November 8th, 1911, and remained open at the end of the year.

The case of Moses Freeman, Lower Heidelberg Township, pollution of Schuylkill River, was referred November 8, 1911, and remained open at the end of the year.

The case of Samuel Merkle, Greenwich Township, pollution of Maiden Creek above the Reading City intake, was referred November 3, 1911, and remained open at the end of the year.

The case of Mrs. Peter Stertzel, Upper Tulpehocken Township, pollution of Schuylkill River, was referred November 3, 1911, and remained pending at the end of the year.

The case of Frank H. Lesher, Upper Bern Township, pollution of Schuylkill River, was referred November 3, 1911, and remained open at the end of the year.

The case of Joseph S. Hicks, Upper Bern Township, pollution of Schuylkill River, was referred December 2, 1911, and was pending at the end of the year.

BRADFORD COUNTY.

The case of Robert Boyd, Canton Township, pollution of Mill Creek, a supply to Canton Borough, was referred October 31, 1911, and was pending at the end of the year.

The case of Earl C. Schrader, Canton Township, pollution of Mill Creek, a supply to Canton Borough, was referred October 31, 1911, and remained open at the end of the year.

The case of H. N. Scott, Armenia Township, pollution of Mill Creek, a supply to Canton Borough, was referred October 31st, 1911, and remained open at the end of the year.

BUTLER COUNTY.

The case of S. E. Williams, Penn Township, pollution of Connoquenessing Creek, was referred September 8, 1911, and reported closed September 26, 1911, without lititgation.

CAMBRIA COUNTY.

The case of John F. Brehme, Middle Taylor Township, nuisance arising from insanitary condition of property, etc., was referred July 28, 1911, and reported closed August 12, 1911, without litigation.

The case of Emery Davis, Upper Yoder Township, nuisance arising from disposing of garbage to pubiic highway, was referred July 28, 1911, and reported closed August 12, 1911, without litigation.

The case of F. C. Sherbaugh, Carroll Township, pollution of Chest Creek, a supply to Patton Borough, was referred November 11, 1911, and remained open at the end of the year.

The case of James Farabaugh, Allegheny Township, pollution of Chest Creek, a supply to Patton Borough. was referred November 11, 1911, and remained open at the end of the year.

The case of John Smith, Lower Yoder Township, nuisance arising from dumping ground, was referred May 31, 1911, and reported closed December 2, 1911, without litigation.

CARBON COUNTY.

The case of William Kreitz, Mahoning Township, pollution of Lehigh River, was referred November 22, 1911, and was pending at the end of the year.

The case of Harvey Swartz, Mahoning Township, pollution of Lehigh River, was referred November 22, 1911, and was pending at the end of the year.

The case of Victor Rehrig, Mahoning Township, pollution of Lehigh River, was referred November 22, 1911, and was pending at the end of the year.

The case of Norman Long, Mahoning Township, pollution of Lehigh River, was referred November 22, 1911, and was pending at the end of the year.

The case of Irvin B. Merkel, Mahoning Township, pollution of Lehigh River, was referred November 22, 1911, and was pending at the end of the year.

The case of Albert Blank, Mahoning Township, pollution of Lehigh River, was referred November 22, 1911, and was pending at the end of the year.

The case of George Ewzain, Sr., Mahoning Township, pollution of Lehigh River, was referred November 22, 1911, and was pending at the end of the year.

The case of Daniel Rosenberg, Mahoning Township, pollution of Lehigh River, was referred November 22, 1911, and was pending at the end of the year.

The case of John Swartz, Mahoning Township, pollution of Lehigh River, was referred November 22, 1911, and was pending at the end of the year.

The case of John Kugler, Mahoning Township, pollution of Lehigh River, was referred November 22, 1911 and was pending at the end of the year.

The case of Edwin Goodhile, Mahoning Township, pollution of Lehigh River, was referred November 22, 1911, and was pending at the end of the year.

The case of Fred Mangold, Mahoning Township, pollution of Lehigh River, was referred November 22, 1911, and was pending at the end of the year.

The case of John Koons, Mahoning Township, pollution of Lehigh River, was referred November 22, 1911. and was pending at the end of the year.

The case of Frank W. Moody, Mahoning Township, pollution of Lehigh River, was referred November 22, 1911, and was pending at the end of the year.

The case of J. C. Heintzelman, Lower Towamensing Township, pollution of Lehigh River, was referred November 22, 1911, and was pending at the end of the year.

The case of Mason Stemler, Towamensing Township, pollution of Lehigh River, was referred November 22, 1911, and was pending at the end of the year.

CENTRE COUNTY.

The case of Arthur Cummings, Miles Township, pollution of Penns Creek, was referred April 12, 1911, and reported closed July 26, 1911, without litigation.

The case of J. F. Hagen, Gregg Township, pollution of Penns Creek, was referred April 12, 1911, and reported closed July 27, 1911, without litigation.

The case of the Spring Mills Creamery Company, Gregg Township, pollution of Penns Creek, was referred April 12, 1911, and reported closed October 31, 1911, without litigation.

The case of John Bowman, Gregg Township, pollution of Penns Creek, was referred April 15th, 1911, and reported closed July 27, 1911, without litigation.

CHESTER COUNTY.

The case of Milton H. Borkey, East Coventry Township, pollution of stream, was referred March 4, 1911, and reported closed June 15, 1911, without litigation.

The case of Adolphus Guie, Caln Township, pollution of East Brandywine Creek, was referred March 4, 1911. Information was made before Squire Paxson, at West Chester, on June 8, 1911, and at the hearing on June 17, 1911, the defendant was bound over to the next term of court. Case was withdrawn on September 27, 1911, as defendant had made an abatement and paid the costs in full.

The case of G. A. Updegrove, North Coventry Township, pollution of the Schuylkill River, was referred March 4, 1911, and reported closed June 15, 1911, without litigation.

The case of Davis and Morris G. Griffith, Upper Uwchlan Township, pollution of East Brandywine Creek, was referred April 12, 1911, and was pending at the end of the year, as the work of abatement was under way.

The case of Christian F. Bader, Schuylkill Township, pollution of French Creek, was referred April 6, 1911, and reported closed May 25, 1911, without litigation

The case of Charles H. Wright, Pennsbury Township, pollution of Ring Run, was referred May 19, 1911, and was pending at the end of the year.

The case of Gramm Rambo, Valley Township, pollution of Sucker Run, a supply to Coatesville Borough, was referred June 27, 1911, and remained open at the end of the year.

The case of Jacob Wolf, Upper Oxford Township, nuisance arising from unburied dead animals, was referred July 28, 1911, and reported closed August 3, 1911, without litigation.

The case of Bernard Repass, East Pikeland Township, pollution of French Creek, was referred August 25, 1911, and remained open at the end of the year.

The case of the Chester Springs Orphan School, West Pikeland Township, pollution of Pickering Creek, was referred January 20, 1911, and was pending at the end of the year.

DELAWARE COUNTY.

The case of James Andrews, Haverford Township, a nuisance arising from piggery, was referred May 12, 1911. Information was made before Alderman Cooper, at Media, and at the hearing on September 19, 1911, the defendant was bound over to the next term of court. Pending at the end of the year.

Pasquali Consolvi and Nickel Nenn were arrested for the pollution of Little Darby Creek by improper disposition of excrement. Information was made before Alderman J. H. W. McQuiston, and both defendants pleaded guilty and were fined $5 each and costs, upon the payment of which they were accordingly discharged.

FAYETTE COUNTY.

The case of John Shearer, Springfield Township, pollution of a tributary to Indian Creek used as a supply by Scottdale Borough, was referred November 20, 1911, and was reported closed November 24, 1911, without litigation.

LANCASTER COUNTY.

The case of William Rice, Rapho Township, pollution of Little Chiquesalunga Creek, used as a supply to Mount Joy Borough, was referred April 11, 1911, and was pending at the end of the year.

LAWRENCE COUNTY.

The case of Herman Knox, Pulaski Township, pollution of the Shenango River, was referred September 8, 1911, and reported closed without litigation on December 1, 1911.

LEBANON COUNTY.

The case of Edwin Kreider, Annville, nuisance arising from waste waters to public highway, was referred July 14, 1911, and reported closed July 24, 1911, without litigation.

LEHIGH COUNTY.

The case of Frank Ritter, North Whitehall Township, pollution of Spring Creek, used as a supply to Catasauqua Borough was referred September 14, 1911. Information was made before Alderman W. L. Jones, at Allentown, but the case was withdrawn at the time of the hearing, November 14, 1911, as defendant had made a satisfactory abatement and paid the costs.

The case of James Louchner, North Whitehall Township, pollution of a tributary to the Lehigh River, was referred October 17, 1911, and information was made before Alderman W. L. Jones, at Allentown, on October 28, 1911, but the case was withdrawn at the time set for the hearing, December 9, 1911, as the defendant had made an abatement and paid the costs.

The case of Elmer Leiby, Heidelberg Township, pollution of Jordan Creek, was referred November 22, 1911, and remained open at the end of the year.

The case of John Stouffer, Lower Milford Township, pollution of Saucon Creek, was referred December 8, 1911. Information was made before Alderman W. L. Jones at Allentown, on December 18, 1911, and the hearing set for December 21, 1911, was continued until January 27, 1912.

MERCER COUNTY.

The case of Sophia Baker, Sugar Grove Township, pollution of Shenango River, was referred January 23, 1911, and reported closed November 2, 1911, without litigation.

The case of Philip Snyder, Pymatuning Township, pollution of Shenango River, was referred February 20, 1911, and remained open at the end of the year.

The case of Henry Ohle, Delaware Township, pollution of Otter Creek, was referred September 8, 1911, and remained open at the end of the year.

The case of Alexander McCullough, East Lackawannock Township, pollution of Wright's Ice Pond, was referred November 1, 1911, and was pending at the end of the year.

MIFFLIN COUNTY.

The case of S. M. Hanawalt, Granville Township, nuisance, was referred November 10, 1911, and was pending at the end of the year.

The case of John Yocum, Granville Township, nuisance, was referred November 10, 1911, and reported closed December 26, 1911, without litigation.

The case of George Caldwell, Granville Township, nuisance, was referred November 10, 1911, and reported closed December 26, 1911, without litigation.

The case of H. C. Culp, Granville Township, nuisance, was referred November 10, 1911, and was pending at the end of the year.

NORTHAMPTON COUNTY.

The case of the Uhl Brewing Company, W. J. Medlar, tenant, Bath Borough, pollution of Monocacy Creek, was referred November 24, 1911, and remained open at the end of the year.

NORTHUMBERLAND COUNTY.

The case of G. M. Kerstetter, Rockefeller Township, pollution of Little Shamokin Creek, used as a supply to Sunbury Borough, was referred August 17, 1911. Information was made October 2, 1911, before Justice Dewitt, at Sunbury, and at the hearing, on October 14, 1911, the defendant was bound over to the next term of court. This case was withdrawn October 25, 1911, as the defendant had made abatement and paid all costs.

SOMERSET COUNTY.

The case of Abe Lowery, Elk Lick Township, pollution of a tributary to the Youghiogheny River, was referred January 23, 1911, and reported closed February 8, 1911, without litigation.

TIOGA COUNTY.

The case of Thomas P. Furman, Ward Township, pollution of Mill Creek, used as a supply to Canton Borough, was referred October 31, 1911, and remained open at the end of the year.

UNION COUNTY.

The case of F. H. Maurer, New Berlin Borough, pollution of Penns Creek, was referred April 10, 1911. Information was made September 15, 1911, and at the hearing on September 16, 1911, the defendant was bound over to the next term of court. Case pending at the end of the year.

The case of S. E. Benner, New Berlin Borough, pollution of Penns Creek, was referred April 10, 1911. Information was made, and the defendant, at the hearing on December 16, 1911, was bound over to the next term of court. Case pending at the end of the year.

WASHINGTON COUNTY.

The case of Anderson Hootman, Amwell Township, charged with the pollution of the Ohio River, and with the assault of an officer of the Department, was referred June 1, 1911. Information was made June 2, 1911, and the case was withdrawn June 14, 1911, as defendant had made an abatement and paid the costs. The defendant is an aged man and the Department officer did not care to press the charge for assault.

YORK COUNTY.

The case of Eli Sterner, Codorus Township, pollution of Codorus Creek above the York City intake, was referred November 29, 1911, and was pending at the end of the year.

The case of C. D. Strousbaugh, Springfield Township, pollution of Codorus Creek above the York City intake, was referred November 29, 1911, and was pending at the end of the year.

The case of William Thorman, Codorus Township, pollution of Codorus Creek above the York City intake, was referred November 29, 1911, and was pending at the end of the year.

The case of E. C. Snyder, Codorus Township, pollution of Codorus Creek above the York City intake, was referred November 29, 1911, and was pending at the end of the year.

The case of Levi K. Bortner, Codorus Township, pollution of the Codorus Creek above the York City intake, was referred November 29, 1911, and remained open at the end of the year.

The case of Lewis Barbeheim, Codorus Township, pollution of Codorus Creek above the York City intake, was referred December 2, 1911, and was pending at the end of the year .

VII. CONCLUSIONS.

There are two propositions which encompass the entire scope of the administration of the law for the preservation of the purity of the waters of the State for the protection of the public health in so far as the discharge of sewer systems is concerned, and they are:

FIRST: The degree of safety which can be expected to be obtained in treating sewage for the removal of bacterial infection.

SECOND: The relative importance of sewage disposal plants and other health protective work, including treatment plants for water works, regarded in the light of the limited resources of the municipal corporation as defined by the constitutional limits of indebtedness and of private corporations, as determined by water rates fixed by franchise or contract with the municipality.

In settling these questions in any particular case, a thorough consideration of all the factors must be had. Each case is a particular problem in itself. In Pennsylvania, owing to the variety of watersheds, geological formation and the development of natural resources each of which, to a greater or less degree, characterizes the quality and quantity of the waters flowing from the watershed, it is impracticable to adopt and promulgate any general standard for the guidance of local authorities and for experts employed by local authorities, both with respect to water works systems and sewer systems and the quality of the waters which are the source of supply to the public. Some of the streams of Pennsylvania are given over absolutely as carriers of industrial wastes, particularly in the coal fields, where drainage from mines, destroys all life in the waters. The highest court of the Commonwealth and the Legislature each has determined the rights of corporations in these districts. In preserving the purity of the waters of the State, each municipality or private corporation in what it does or wishes to do, has its own peculiar relationship to the problem. The policy of setting forth at length many of the reasons which govern the determinations of the Commissioner of Health, or of the Governor, Attorney General and Commissioner of Health, in the case of sewage disposal, which up to this time has prevailed in the decrees, has been discontinued, and it is now the practice to have conferences with the local authorities on all the questions which may arise. Many such conferences have been held during the year and a better understanding of the entire subject as viewed by the State Department of Health has resulted. Engineers and others seeking information can obtain the same by reference to reports on file in the Department's office.

Division of Accounting and Purchasing.

E. I. SIMPSON, Chief of Division.

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THE DIVISION OF ACCOUNTING AND PURCHASING.

E. I. SIMPSON, Chief.

Sixth Annual Financial Report.

The Commissioner begs leave to respectfully report that under the appropriations of the Legislature of 1909 for the use of the several Divisions of the Department, the following sums were received and expenditures made during the year 1911.

Summary showing balances to December 31st, 1910, as given in the fifth Annual Report of the Department.

APPROPRIATIONS, ACT NO. 659.

Item No. 1 for the payment of salaries of the General Office, Medical Division, Laboratories and Experimental Station, Division Distribution of Biological Products, Bureau of Vital Statistics, Bureau of Morbidity and Marriage Statistics, Sanitary Engineering Division, Division of Accounting and Purchasing, and Division of Supplies, for two years ending May 31st, 1911, the sum of, ...		$255,000 00
Total expenditures as per report to December 31st, 1909,	$73,541 63	
Total expenditures as per report to December 31st, 1910,	127,476 70	
		201,018 33
Unexpected balance of appropriation, January 1st, 1911,		$53,981 67

Item No. 2 for the payment of the cost of Diphtheria Antitoxin and other biological products for free distribution among the poor, for the employment of special and assistant engineers, stream and sanitary inspectors and such other employees as may be necessary, for the fees and necessary traveling expenses of the County Medical Inspectors and rural Health Officers, for the necessary traveling expenses of the Commissioner of Health, his assistants and other employees, for the maintenance of the Bureau of Vital and Morbidity Statistics, for the maintenance of Laboratories and experimental station, for the payment of the expenses of maintaining and nursing at the State Quarantine Station at Marcus Hook, Pa., persons taken from vessels who are suffering from or have been exposed to communicable diseases in cases regarded by the Commissioner of Health as cases of great emergency and for the payment of all other necessary expenses of the Department in suppressing epidemics of diseases and protecting the public health in emergencies, for two years ending May 31st, 1911, the sum of, ...		$745,000 00
Total expenditures as per report to December 31st, 1909,	$154,721 94	
Total expenditures as per report to December 31st, 1910,	404,219 94	
		558,941 88
Unexpended balance of appropriation, January 1st, 1911,		$186,058 12

Item No. 3 for the acquiring of property, constructing, equipping and maintaining sanatoria, infirmaries and dispensaries for the free treatment of indigent persons affected with tuberculosis and for the maintenance of laboratories, for sanitary supervision, isolation, education and treatment of indigent persons affected with tuberculosis, for the payment of salaries and for all other necessary expenses which may be incurred in this tuberculosis work, for two years ending May 31st, 1911, the sum of		$2,000,000 00

Total expenditures as per report to December 31st, 1909,	$390,716 62	
Total expenditures as per report to December 31st, 1910,	1,021,809 54	
		1,412,526 16
Unexpended balance of appropriation, January 1st, 1911,		$587,473 84

APPROPRIATION 1907. POLK FUND, ACT NO. 355.

Amount set aside for this Department's share in this work,		$5,000 00
Total expenditures as per report to December 31st, 1909,	$3,563 54	
Total expenditures as per report to December 31st, 1910,	1,153 33	
		$4,716 87
Unexpended balance on hand, January 1st, 1911, ...		$283 13

And that the receipts and expenditures on account of the appropriation of 1909 from January 1st, 1911 to December 31st, 1911, have been as follows:

GENERAL FUND, ACT NO. 659, ITEM NO. 1.

Receipts.

The Auditor General issued warrants on account of general salaries as follows:

January 5th,	$9,666 60	
January 24th,	833 33	
February 14th,	833 33	
February 9th,	9,666 65	
March 6th,	9,666 74	
March 16th,	833 34	
April 8th,	9,666 60	
April 15th,	833 33	
May 8th,	9,666 60	
May 17th,	833 33	
		$52,499 85
		$52,499 85

Disbursements.

Salaries paid by State Treasurer:

General Office salaries,	$5,191 66	
Medical Division salaries,	5,499 98	
Laboratory and Experimental Station salaries,	3,841 66	
Division of Biological Products salaries,	2,266 66	
Bureau of Vital Statistics salaries,	6,166 66	
Bureau of Morbidity and Marriage Statistics salaries,	2,416 66	
Sanitary Engineering Division salaries,	15,383 27	
Division of Supplies salaries,	1,683 32	
Commissioner's salary,	4,166 66	
Division of Accounts and Purchasing salaries,	5,883 32	
		$52,499 85
		$52,499 85

SUMMARY.

Appropriation,		$255,000 00
Expenditures from June 1, 1909 to December 31, 1909,	$73,541 63	
Expenditures from January 1, 1910 to December 31, 1910,	127,476 70	
Expenditures from January 1, 1911, to May 31, 1911,	52,499 85	
		$253,518 18
Unexpended balance of appropriation, January 1st, 1912,		$1,481 82

GENERAL FUND, ACT NO. 659, ITEM NO. 2.

Receipts.

Cash on hand, January 1st, 1911, as per report December 31, 1910,		$30,849 66
Received from the Auditor General warrants on account as follows:		
January 26th,	$31,041 66	
February 28th,	31,041 66	
March 3rd,	31,041 66	
May 3rd,	31,041 74	
May 31st,	31,041 74	
		$155,208 46
Total receipts,		$186,058 12

Disbursements.

Medical Division.

Expenses Health Officers and County Medical Inspectors on account correspondence, reports, inspecting, quarantining and disinfecting the following diseases and nuisances:		
Cerebrospinal meningitis,	85 23	
Smallpox inspection,	1,554 84	
Pneumonia,	285 99	
Erysipelas,	321 84	
Infantile paralysis,	95 32	
Malarial fever,	9 45	
Tetanus,	23 29	
Impetigo contagiosa,	19 50	
Cancer,	2 37	
Asiatic cholera,	1,956 54	
Tonsillitis,	18 47	
Scabies,	43 48	
Dysentery,	5 25	
Measles and mumps,	15,426 91	
Typhoid fever,	13,213 99	
Diphtheria,	22,483 02	
Scarlet fever,	7,969 63	
Whooping cough,	3,953 94	
Tuberculosis,	1,914 71	
Chicken pox,	3,397 50	
Miscellaneous expenditures:		
Establishing local boards of health,	16 56	
Freight and drayage on supplies, disinfectants, etc.,	1,216 44	
Disinfectants,	4,342 84	
Filing blanket affidavits by Health Officers and County Medical Inspectors,	168 30	
General Sanitary Inspection,	90 66	
Educational matter,	25 66	
Advertising rules and regulations,	3 20	
Sanitary inspection of schools,	141 96	
Expenses instructing and appointing Health Officers,	2,989 59	
Laboratory,	5,461 09	
Legal services,	1,806 88	
Nuisance inspection,	24,585 36	
		$113,629 81

Engineering Division.

Engineers' salaries,	$4,876 25	
Inspectors' salaries,	25,580 34	
Pure water inspection,	22,424 95	
		$52,881 54

Division Vital, Morbidity and Marriage Statistics:

Vital Statistics,	$1,068 14	
Morbidity and marriage statistics,	1,997 66	
		$3,065 80

General Expenses.

Postage,	$8,930 81	
Clerical salaries,	5,292 41	
Janitors' services, etc.,	443 00	
General expense,	500 73	
Secretary's to commissioner traveling expense,	41 80	
Commissioner's traveling expense,	100 06	
Office expense,	1,172 14	
		$16,480 95
		$186,058 10
Cash on hand January 1st, 1912,		02
		$186,058 12

SUMMARY.

Appropriation,		$745,000 00
Expenditures from June 1, 1909 to December 31, 1909,	$154,721 94	
Expenditures from January 1, 1910 to December 31, 1910,	404,219 94	
Expenditures from January 1, 1911 to December 31, 1911,	186,058 10	
		744,999 98
Unexpended balance of appropriation January 1st, 1912,		$0 02

Note:—The following amounts were received by the Department:

June 3rd, interest on Bank Balance,	$300 20	
December 4th, interest on Bank Balance,	51 73	
March 6th, refund on voucher No. 17,686,	26	
December 1st, refund on voucher No. 23,461,	20	
December 2nd, refund on voucher No. 23,188,	3 70	
		$356 09
		$356 09

These were returned to State Treasurer on the following dates:

June 3rd,	$300 20	
July 12th,	26	
December 5th,	51 73	
December 29th,	3 90	
		$356 09
		$356 09

TUBERCULOSIS FUND, ACT NO. 659, ITEM NO. 3.

Receipts.

Cash on hand January 1st. 1911,		$24,140 45
Received from Auditor General warrants on account as follows:		
January 6th,	$63,333 33	
January 31st,	83,333 33	
February 28th,	83,333 33	
March 24th,	83,333 33	
May 3rd,	83,333 33	
June 9th,	83,333 37	
July 31st,	83,333 37	
		$563,333 39
Total receipts,		$587,473 84

Disbursements.

Mont Alto Sanatorium.

Maintenance:	
Nurses' salaries,	10,406 50
Miscellaneous salaries, maintenance,	27,026 88
Drugs,	846 94

Traveling expenses, maintenance,	312 27		
Food stuffs,	36,310 85		
Insurance,	1,758 27		
Legal services,	15 00		
Advertising,	10 20		
Milk and eggs,	35,288 26		
Postage,	107 00		
Operating expense,	23,602 02		
Doctors' salaries,	6,735 93		
Disinfectants,	668 03		
Education,	24 86		
Domestic salaries,	1,276 19		
Salad oil,	34 00		
Blanket affidavits,	1 25		
		$144,424 45	
Miscellaneous accounts:			
Furnishings,	$3,462 67		
Building supplies,	393 64		
Freight and Drayage,	1,348 87		
Operating supplies,	3,950 39		
		$9,155 57	
Expenditures account Permanent Improvements:			
New roads, sidewalks, etc.,	$219 87		
Miscellaneous salaries on account construction,	498 45		
Laboratory, Morgue, Chicken House and stable,	160 42		
Garbage disposal plant,	32 50		
Central heating plant,	28,563 43		
Nurses' and physicians' building, children's building, etc.,	92,457 83		
Traveling expenses, engineers, on account construction,	233 18		
Water works system,	164 81		
Superintendent's salary, State Board Grounds and Buildings,	825 00		
New fire line,	8 00		
On account of finishing, Chas. W. Denny contract, Nurses' and Physicians' building, etc.,	3,950 41		
On account finishing Frank M. Goble contract, Nurses' and Physicians' building, etc.,	217 02		
		$127,330 92	
Total expenditures on account Mont Alto Sanatorium, January 1, 1911 to December 31, 1911,			$280,910 94

Dispensaries.

Maintenance:			
Clerical salaries,	$7,326 45		
Rent,	10,407 70		
Disinfectants,	789 34		
Educational matter,	47 15		
Postage,	324 64		
Tubercle product,	1,397 60		
Salad oil,	1,453 50		
Blanket affidavits,	29 70		
Drugs,	2,207 72		
Traveling expenses,	7,243 59		
Doctor's salaries,	44,518 15		
Domestic salaries,	3,659 51		
Milk and eggs,	69,836 01		
Nurses' salaries,	41,417 54		
Freight and drayage,	246 56		
Operating expense,	4,965 35		
		$195,870 51	
Miscellaneous expenses:			
Operating supplies,	$1,221 83		
Furnishings,	1,855 43		
Traveling tuberculosis exhibit,	548 12		
		3,625 38	
Total expenditures account dispensaries from January 1, 1911 to December 31, 1911,			$199,495 89

Cresson Sanatorium.

Miscellaneous expenses on account of Construction:		
Clearing Tract, original survey, etc.,	$1,883 60	
Blanket Affidavits,	25	
Traveling expenses, Engineers,	125 06	
Chicken House,	8 97	
Miscellaneous building supplies,	30 00	
Freight and Drayage on supplies, etc.,	22 43	
Legal services,	2 50	
Drilled wells,	1,088 10	
Water supply system,	132 10	
Account Dining Room Building, East Ward Building, Power and Laundry Building, etc.,	92,024 88	
Repairs to Jones cottage,	101 93	
Miscellaneous supplies,	23 10	
Miscellaneous salaries, construction account,	55 92	
Miscellaneous expenses,	562 53	
Total expenditures account Cresson Sanatorium from January 1, 1911 to December 31, 1911,		$96,061 37

Hamburg Sanatorium.

On account clearing tract, original survey, etc.,	$210 26	
Taxes,	101 70	
Total expenditures account Hamburg Sanatorium from January 1, 1911 to December 31, 1911,		311 96
Total expenditures account Tuberculosis fund from January 1, 1911 to December 31, 1911,		$576,780 16
Cash on hand January 1st, 1912,		10,693 68
		$587,473 84

SUMMARY.

Appropriation,		$2,000 000,00
Expenditures 6-1-09—12-31-09,	390,716 62	
Expenditures 1-1-10—12-31-10,	1,021,809 54	
Expenditures, 1-1-11—12-31-11,	576,780 16	
		1,989,306 32
Unexpended balance appropriation January 1st, 1912,		10,693 68

Note: The following amounts were received by the department:

January 4th, refund on voucher No. 30752,	1 79	
March 14th, refund on voucher No. 37078,	22 31	
March 14th, refund on voucher No. 37050,	6 46	
April 8th, sale empty cement sacks,	61 10	
April 11th, refund on voucher, No. 38702,	2 05	
May 2nd, refund on voucher No. 40351,	35	
June 7th, sale refuse matter, laboratory,	2 00	
June 28th, interest on bank balance,	724 03	
July 18th, refund on voucher No. 44071,	3 75	
July 28th, refund on voucher No. 44006,	33	
July 31st, forfeit deposit on account thermometers loaned to patients,	29 80	
November 2nd, refund on voucher No. 38723,	55	
December 2nd, interest on bank balance,	400 28	
		$1,254 80

These were returned to State Treasurer on the following dates:

June 28th,	$724 03	
July 28th,	33	
July 5th,	104 56	
August 15th,	2 00	
December 29th,	400 28	
		$1,231 20
Balance on hand January 1st 1912,		23 60
		$1,254 80

POLK FUND.

And that the receipts and expenditures on account of the Polk Fund from January 1st, to December 31st 1911, have been as follows:

Cash on hand January 1st, 1911,	$283 13
Expenditures on account General Supervision Jan. 1, 1911 to Dec. 31, 1911,	139 96
Unexpended balance on hand January 1st, 1912,	$143 17

The Commissioner further begs leave to report that the Legislature of 1911 appropriated the following sums for the use of the several divisions of the Department.

APPROPRIATIONS—Act No. 864.

Item No. 1 for the payment of salaries of the General Office, Medical Division, Laboratories and Experimental Station, Division Distribution of Biological Products, Bureau of Vital Statistics, Morbidity and Marriage Statistics, Sanitary Engineering Division, Division of Accounting and Purchasing, Division of Supplies and Division of Dispensaries, the sum of,	$336,520 00
And Item No. 2 for the payment of the cost of diphtheria antitoxin and other biological products, for free distribution among the poor: for the employment of such special and assistant engineers, stream and sanitary inspectors, and such other employees as may be necessary; for the fees and necessary traveling expenses of the county medical inspectors and rural health officers; for the necessary traveling expenses of the Commissioner of Health, his assistants, and other employees; for the maintenance of the Bureau of Vital and Morbidity Statistics: for the maintenance of laboratories and experimental station: and for the payment of all other necessary expenses of the Department of Health in supervising epidemics, disease and in protecting the public health, the sum of,	746,152 00
And Item No. 3 for the acquiring of property, constructing, equipping and maintaining sanatoria infirmaries and despensaries for the free treatment of indigent persons affected with tuberculosis and for the maintenance of laboratories, for sanitary supervision, isolation, education and treatment of indigent persons affected with tuberculosis, for the payment of salaries and for all other necessary expenses which may be incurred in this tuberculosis work, the sum of,	2,624,808 00

The receipts and expenditures on account of these appropriations from June 1st, 1911 to December 31st, 1911, have been as follows:

GENERAL FUND, ACT No. 864, ITEM No. 1.

Receipts.

The Auditor General issued warrants on account general salaries as follows:

June 20th,	$13,130 90
June 21st,	833 34

July 12th,	13,130 76	
July 19th,	833 33	
August 31st,	13,188 34	
August 31st,	833 33	
September 26th,	13,188 40	
September 19th,	833 34	
October 14th,	833 33	
October 16th,	12,798 26	
November 8th,	833 33	
November 16th,	13,048 34	
December 6th,	13,188 40	
		$96,673 40
		$96,673 40

Disbursements.

Salaries paid by State Treasurer:

General Office salaries,	$9,251 68	
Division of Accounting and Purchasing salaries,	12,000 00	
Sanitary Engineering Division salaries,	25,376 69	
Morbidity and Marriage Statistics salaries,	3,733 34	
Vital Statistics salaries,	9,473 34	
Division of Dispensaries,	8 586 67	
Medical Division salaries,	10,056 67	
Laboratory and Experiment Station salaries,	7,315 00	
Division of Distribution of Biological Products salaries,	3,173 34	
Division of Supplies salaries,	2,706 67	
Commissioner's salary,	5,000 00	
		$96,673 40
		$96,673 40

SUMMARY.

Appropriation,	$336,520 00
Expenditures from June 1, 1911 to December 31, 1911,	96,673 40
Unexpended balance Appropriation January 1st, 1912,	239,846 60

GENERAL FUND, ACT No. 864, ITEM No. 2.

Receipts.

Received from the Auditor General warrants on account as follows:

June 21st,	$31,089 66	
July 21st,	31,089 66	
August 22nd,	31,089 66	
September 19th,	31,089 66	
October 14th,	31,089 66	
November 29th,	31,089 66	
December 21st,	31,089 66	
		$217,627 62
		$217,627 62

Disbursements.

Medical Division.

Expenses Health Officers and County Medical Inspectors on account correspondence, reports, inspecting, quarantining and disinfecting, the following diseases and nuisances:

Smallpox inspection,	2,819 14
Chicken pox,	1,691 84
Diphtheria,	24,615 54
Measles,	7,832 90
Mumps,	1,517 78
Scabies,	111 57
Scarlet Fever,	5,450 43
Tetanus,	307 06
Tuberculosis,	1,151 97
Typhoid Fever,	11,474 12

Whooping Cough,	4,206 29	
Cerebrospinal Meningitis,	118 53	
Cholera,	1,921 52	
Erysipelas,	244 32	
Infantile Paralysis,	71 27	
Pneumonia,	90 24	
Cancer,	6 36	
Dysentery,	12 10	
Leprosy,	6 63	
Malarial Fever,	25 81	
Tonsillitis,	8 06	
Miscellaneous Expenditures:		
Educational matter,	387 60	
Freight and drayage,	1,593 71	
Laboratory,	5,978 35	
Blanket affidavits,	25 75	
Establishing Local Boards of Health,	192 10	
Dairy Inspection,	8,950 00	
Disinfectants,	2,885 27	
Instructing and appointing Health Officers,	2,545 45	
Nuisance inspection,	2,711 82	
Commissioner's traveling expenses,	57 00	
Legal services,	1,574 70	
Austin relief fund,	23,012 28	
School inspection,	333 87	
Secretary to Commissioner, traveling expenses,	11 65	
		$113,943 72

Engineering Division.

Engineers' salaries,	$3,912 50	
Inspectors' salaries,	35,893 08	
Pure water inspection,	29,727 18	
		69,532 76

Division Vital, Morbidity and Marriage Statistics:

Marriage statistics,	$690 98	
Morbidity statistics,	524 96	
		1,215 94

General Expenses.

Clerical salaries,	$3,387 97	
Janitor's service, etc.,	643 00	
Office expense,	1,608 95	
Postage,	6,141 47	
Miscellaneous expenses,	218 40	
		11,999 79
Total expenses on account of general fund June 1, 1911 to December 31, 1911,		$196,692 21
Cash on hand January 1st, 1912,		20,935 41
		$217,627 62

SUMMARY.

Appropriation,		$746,152 00
Expenditures from June 1, 1911 to December 31, 1911,		196,692 21
Unexpended balance appropriation January 1st, 1912,		$549,459 79
Note: The following amounts were received by the Department:		
June 26th, refund on voucher A83,	$28 00	
December 6th, interest on Bank Balance,	270 62	
December 8th, refund by Adams Express Company to correct overcharges,	14 20	
December 12th, fees for certified copies birth and death certificates,	2,275 50	
		$2,588 32
		$2,588 32

These were returned to the State Treasurer on the following dates:

June 26th,	$28 00	
December 6th,	270 62	
December 14th,	2,275 50	
		$2,574 12
Balance on hand January 1st, 1912,		14 20
		$2,588 32

TUBERCULOSIS FUND, ACT NO. 864, ITEM NO. 3.

Receipts.

Received from the Auditor General warrants on accounts as follows:

June 21st,	$109,367 00	
August 24th,	109,367 00	
October 31st,	109,367 00	
November 29th,	109,367 00	
		$437,468 00
Total receipts,		$437,468 00

Disbursements.

Mont Alto Sanatorium.

Maintenance:		
Clerical salaries,	$971 00	
Doctors' salaries,	7,557 36	
Drugs,	623 96	
Food stuffs,	26,102 28	
Meat account,	14,251 28	
Operating expenses,	10,478 96	
Postage,	351 00	
Stationery supplies,	154 38	
Traveling expenses on account of maintenance,	313 25	
Disinfectants,	689 73	
Insurance,	5,779 53	
Kitchen help salaries,	3,993 21	
Milk and eggs,	33,267 94	
Miscellaneous salaries maintenance,	18,100 48	
Nurses' salaries,	11,070 07	
Orderlies' salaries,	1,771 20	
Waitresses' and chambermaids' salaries,	6,732 13	
Blanket affidavits,	1 25	
Coal,	1,211 89	
Salad oil,	21 25	
Advertising,	70 54	
		$143,512 69
Miscellaneous account:		
Building supplies,	378 69	
Medical supplies,	512 71	
Miscellaneous supplies,	4,131 39	
Freight and drayage on supplies, etc.,	1,051 80	
Linen supplies,	176 00	
Fire extinguishers,	47 99	
Kitchen utensils,	1,467 21	
Furnishings,	352 16	
Cutlery and silverware,	1 32	
		$8,119 27
Expenditures account permanent improvements:		
Miscellaneous salaries account construction,	7,402 17	
New roads, sidewalks, etc.,	2,728 03	
Superintendent's salary, State Board Grounds and Buildings,	620 00	
Engineers' traveling expenses account construction,	166 18	
Central heating plant,	10,042 72	
Garbage disposal plant,	24 00	

New fire line,	6 72		
Chicken house,	4 64		
		$20,994 46	
Total expenditures account Mont Alto, June 1, 1911 to December 31, 1911,			$172,626 42

Dispensaries.

Maintenance:			
Milk and eggs,	44,264 40		
Operating expenses,	3,719 63		
Salad oil,	1,072 70		
Rent,	14,245 40		
Blanket affidavits,	2 25		
Clerical salaries,	3,012 10		
Disinfectants,	432 50		
Doctors' salaries,	33,499 45		
Janitors' salaries,	3,506 87		
Drugs,	937 91		
Freight and drayage,	187 28		
Nurses' salaries,	40,382 21		
Postage,	266 24		
Traveling expenses,	6,407 41		
Tubercle bacilli products,	1,710 89		
		$153,647 24	
Miscellaneous expenses:			
Operating supplies,	$75 34		
Furnishings,	290 33		
Traveling tuberculosis exhibit,	1,540 48		
		1,906 15	
Total expenditures on account Dispensaries, June 1, 1911 to December 31, 1911,			$155,553 39

Cresson Sanatorium.

Miscellaneous expenses on Account Construction:		
Building supplies,	123 03	
Freight and Drayage,	26 43	
Water supply,	176 72	
Fences,	1,482 35	
Macadam roadway,	133 09	
Well,	2,842 88	
Survey, clearing tract, etc.,	1,437 25	
Traveling expenses, account construction,	25 72	
Fire line,	53 48	
East Ward Building, Connecting Corridor, Dining and Administration Building, Power and Laundry Building,	40,032 17	
Chicken House,	120 51	
Repairs to Jones cottage,	37 60	
Miscellaneous expenses,	833 51	
Total expenses account Cresson Sanatorium from June 1, 1911 to December 31, 1911,		$47,324 74

Hamburg Sanatorium.

Survey, clearing tract, etc.,	556 60
Total expenses account Tuberculosis Fund, June 1, 1911 to December 31, 1911,	$376,061 15
Cash on hand January 1st, 1912,	61,406 85
	437,468 00

SUMMARY.

Appropriation,	$2,624,808 00
Expenditures, June 1, 1911 to December 31, 1911,	376,061 15
Unexpended balance of appropriation January 1st, 1912,	$2,248,746 85

Note: The following amounts were received by the Department:

September 19th, proceeds from Hamburg Farm, ...	$234 42	
Farm, ...	$234 42	
November 8th, forfeited deposits for thermometers,	14 00	
December 26th, interest on bank balance, ...	917 65	
December 29th, refund on voucher A5556, ...	7 50	
December 29th, refund on voucher A7492, ...	06	
		$1,173 63
		$1,173 63

These were returned to State Treasurer as follows:

September 20th, ...	$234 42	
December 29th, ...	917 65	
		$1,152 07
Balance on hand January 1st, 1912, ...		21 56
		$1,173 63

APPENDIX.

Financial Report showing the cost of the Relief Work at Austin during 1911. Also a Statement of Contributions received by the Commissioner of Health from various Institutions and Individuals for the Relief of Austin:

Wages of men employed in moving the debris and searching for bodies at Austin and Costello, help at Morgue, Commissary Department, and distributing clothing, ...	$12,298 36	
Carpenters, ...	299 03	
Teams, teamsters, ...	814 64	
Transportation of laborers and other help, ...	1,033 88	
		$14,445 91
Doctors' services, ...	402 70	
Traveling expenses of Doctors, Engineers, Nurses, Clerks, etc., ...	1,035 12	
Board and Lodging for Doctors, Engineers, Nurses, Clerks, etc., ...	139 00	
		$1,576 82
Food stuffs, meat, etc., ...	4,823 87	
Wages of cooks and kitchen help, ...	122 90	
		$4,946 77
Miscellaneous supplies, such as shovels, picks, hardware, etc., ...	2,018 23	
Miscellaneous expenses, telephone, stationery, etc.,	24 55	
		$2,042 78
Total expenditures, ...		$23,012 28

CONTRIBUTIONS.

Wellsboro Relief Committee, Leonard Harrison, chairman, ...	$625 00
Citizens' Permanent Relief Committee, Philadelphia, Pa., ...	5,000 00
Pittsburgh Austin Relief Fund, Pittsburgh, Pa., ...	2,526 99
Milton Austin Relief Fund, J. C. Linder, Treasurer, ...	700 00
Rudolph Peterson, representing schools of Westport, Clinton Co., Pa.,	10 50
Cambria Steel Co., Johnstown, Pa., ...	1,000 00
A. J. Selin, Cross Forks, Pa., ...	10 00
Citizens of Wilcox, Elk Co., Pa., ...	1 00
Chas. Wolf, Mayor of Williamsport, Pa., ...	1,000 00
Ladies' Relief Committee, St. Marys, Pa., ...	116 75
M. A. Grissinger, Retreat, Pa., ...	5 00
H. G. Seeling, Railraod, Pa., ...	25 00

Borough Schools, Sayre, Pa.,	90 00
F. G. Hoagland, Renovo, Pa.,	13 00
J. W. Cook, Pittsburgh, Pa.,	25 00
Anonymous contributions,	101 50
Annie Brindlinger, Boyerstown, Pa.,	5 00
Mrs. A. T. Oberdorf, Hershey, Pa.,	1 00
James D. Winsor, Haverford, Pa.,	80 00
Samuel Hartzell, McGee Mills, Pa.,	10 00
H. J. Hoover and Citizens of Portage, Pa.,	38 75
Receipts of Staff dining room, contributed by visitors geeting meals, ..	72 38
Alice P. D. Derrick,	10 00
First National Bank of Mansfield, Pa.,	12 00
Civic Club, Northumberland, Pa.,	122 45
Elizabeth J. Quinton, Edge Hill, Pa.,	5 00
Employees West Virginia Pulp and Paper Co., Williamsburg, Pa., ..	102 50
Esher K. Smith, Harrisburg, Pa.,	1 00
Miss P. W. McK. Downs, Three Runs, Pa.,	4 00
A L. Garver, General Manager, Roaring Springs Blank Book Co., Roaring Springs, Pa.,	15 00
Wm. Hazen, Cashier, Evening Post, New York City,	15 00
Mrs. P. E. Decker and citizens of Athens, Pa.,	108 61
Victor Talbot and citizens of Port Angeles, Washington,	9 00
News Publishing Co., Shamokin, Pa.,	37 00
Joseph H. Young, 614 Perry Building, Philadelphia, Pa.,	1 00
Anna S. Priestly, Northumberland, Pa.,	87
Lena R. Harrison, Secretary Ladies' Aid Society, Asbury M. E. Church, Dover, Del.,	5 00
Maria Heywood Lewis, Philadelphia, Pa.,	10 00
Pastime Amusement Co., J. Frank Clugstone, Manager, Winburne, Penna.,	24 55
Superintendent of General Electric Co.,	10 54
J. C. Henry, Treasurer, Aspinwall Lodge, No. 1135 I. O. O. F., Aspinwall, Pa.,	5 00
Benj. M. Davidson, Chairman of Committee, Gulf Mills Christian Church, Gulf Mills, Pa.,	27 15
Total contributions,	$11,982 54

Division of Supplies.

CHARLES HARTZELL, Superintendent.

DIVISION OF SUPPLIES.

The following report for the year 1911 shows a marked increase in the work of this Division as indicated by the comparative table of shipments by express alone, given below:

SHIPMENTS BY EXPRESS.

1907—July to December,	832
1908—January to June,	1,824
1908—July to December,	2,512
1909—January to June,	3,376
1909—July to December,	3,880
1910—January to June,	4,313
1910—July to December,	2,962
1911—January to June,	4,904
1911—July to December,	3,479

ROUTINE WORK OF THE DIVISION.

Besides making all shipments, this Division also receives and receipts for all express and freight matter, assorts and delivers the same to the various Divisions of the Department.

All printed matter is here received and immediately counted and systematically arranged for distribution.

Requisitions for all supplies required by the six hundred and seventy (670) Health Officers of the Department, the State Tuberculosis Sanatorium at Mont Alto, the sixty-six (66) County Medical Inspectors and one hundred and fifteen (115) Tuberculosis Dispensaries, as well as the different Divisions, namely, General, Medical Inspection, Sanitary Engineering, Vital Statistics, Distribution of Biological Products, Tuberculosis Dispensaries, Tuberculosis Sanatoria, Laboratories, Accounting and Purchasing, are received and promptly filled.

During the past year nine hundred and sixty (960) units of disinfectants (5 gals. formaldehyde, 22 lbs. potassium permanganate, and 5 rolls gummed paper) were shipped to the Dispensaries and Health Officers.

This Division also assembles shipping outfits and forwards them, upon request, to all the physicians in Pennsylvania (approximately 10,000) for sending specimens to the State Laboratories, 2000 Arch Street, Philadelphia, for pathological and bacteriological examination.

All mailing lists, schedules and catalogues are made and corrected almost daily, as necessary, and two thousand (2,000) copies of the Annual Report of the Department and ten thousand (10,000) monthly Health Bulletins are mailed to noted officials, physicians, colleges, libraries, institutions, and others, both in this and foreign countries, who are interested in the work of this Department.

All furniture, including desks, chairs, carpets, typewriters, printing machinery and other articles required by the several Divisions are furnished through this Division as required, by requisitions properly signed.

The amount of stock necessary to carry on hand is yearly increasing and the storage space, consequently, becoming more limited. It is very essential that additional space be shortly provided.

ERRATA

Note.—The manuscript of this report was prepared and sent to the printer at a time when Dr. Lee was in poor health and unable fully to exercise his editorial function. As a result, and also because of other complications, many errors and irregularities have slipped into the text. It has not been practicable to make all the necessary corrections. In the following list the more serious errata are noted.

P. 7 Under Lebanon, for "Reigel" read "Riegel."
P. 27 To the staff of the Sanatorium add:—
George B. Kunkel, M. D., Harrisburg, Consulting Surgeon.
Charles S. Rebuck, M. D., Harrisburg, Visiting Laryngologist.
P. 32 To the Towanda Dispensary add: Dr. S. M. Woodburn.
To the Harrisburg Dispensary add: Dr. J. W. Ellenberger.
P. 33 To the Erie Dispensary add as Substitute Physician, Dr. J. B. Howe.
To the Wilkes-Barre Dispensary add: Dr. W. J. McGuire.
P. 44 To the Draughtsmen add:* Harry A. Otto, Charles L. Andrews, C. F. Orth.
To the Sanitary Inspectors add: M. A. Barrett, *Berkey H. Boyd, *T. F. Burke, E. I. Confer, William Davis, *W. H. Kauffman, J. C. Yeager.
P. 89 line 26. For "Mifflin" read "Mifflintown."
P. 99 Under Typhoid Fever insert: Benton, C. J. Hunt; Florin, C. J. Hunt; Tarentum, C. J. Hunt.
Under Smallpox insert: York, C. J. Hunt.
Under Smallpox strike out: Uniontown, and Franklin County.
P. 100 line 2. For "J. F. Harris" read "George F. Harris."
Line 6. For "Michael V. Hall" read "Michael V. Ball."
P. 109 In Adams County let it read "Huntingdon," and in Chester County let "Parkersburg" read "Parkesburg."
P. 110 In Delaware County transfer Clifton Heights to the Boroughs.
In Erie County let it read "LeBoeuf."
In McKean County for "Allegheny" read "Allegany."
P. 111 In Potter County for "Allegheny" read "Allegheny."
In York County for "Cadorus" read "Codorus."
P. 150 line 8 from bottom. Let it read "No. 85."
P. 170 line 5 from bottom. For "statute" read "stature."
P 201 In the title let it read "Meningitis."
P. 214 last line. Strike out "South."
P. 215 line 9. Catasauqua is of course in Lehigh County.
P. 272 The alphabetical order of these abstracts is somewhat disturbed.
P. 276 line 8. For "leutic" read "luetic."
P. 288 line 2. For "ten" read "two."
P. 297 line 1. For "Hillton" read "Hilltown."
P. 317 line 9 from bottom. For "Folk" read "Falk."
P. 320 line 11. For "Stuben" read "Steuben."
P. 323 line 4, etc. For "Braircreek" read "Briar Creek."
P. 334 lines 2 and 7 from bottom. For "Dickenson" read "Dickinson."
P. 379 line 24. For "Sudsbury" read "Sadsbury."
P. 380 line 10 from bottom. For "Reigel" read "Riegel."
P. 381 line 16 from bottom. For "Union County" read "Union Township."
P. 395 line 12 from bottom. For "Smithton" read "Hamilton."
P. 403 line 5 from bottom (and elsewhere). For "Norweigen" read "Norwegian."
P. 424 line 18 from bottom. For "yield" read "wield."
P. 429 line 13 from bottom. For "Pocohontus" read "Pocahontas."
P. 437 line 19 and
P. 439 last line. For "Schmuehl" read "Schmehl."
P. 450 line 8. For "Centermorel" read "Center Moreland."
P. 488 top. For "Forrest" read "Forest."
P. 638 The last seven titles should be grouped as "Dairy Inspection."
P. 642 In the last column (1911) of the last table let the death rates read: Malformations, 17.2; Early Infancy, 88.7; Old Age, 18.0; Ill-defined 13.8.
P. 877 line 3. For "Diphtheria decreased 29979" read "Measles decreased 15979."
P. 933 line 28. For "page 949" read "page 935."
P. 949 line 11. For "November 3" read "October 6."
P. 957 line 19. For "chart shows" read "charts show."
P 961 last line. For "page 991" read "page 976."
P. 984 In Chester County, for "Parkersburg" read "Parkesburg."
P. 1102 In this table, from page 1416 to 1493 it is necessary to subtract 13 in each case on account of an oversight in renumbering.
P. 1103 line 11. For "enthresol" read "entresol."
P. 1107 line 18 from bottom. For "Eckert" read "Eckbert."
P. 1141 No. 338. For "Jackson" read "Johnstown."
P. 1155 No. 16. For "Rumphs" read "Rumpf's."
P. 1166 No. 48. Add "Warren."
P. 1193 line 14. For "Home" read "School."
line 15. For "average disposals" read "sewage disposals."
P. 1253 line 32. For "2nd" read "22nd."
P. 1430 line 22. For "Parked" read "Parker."

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